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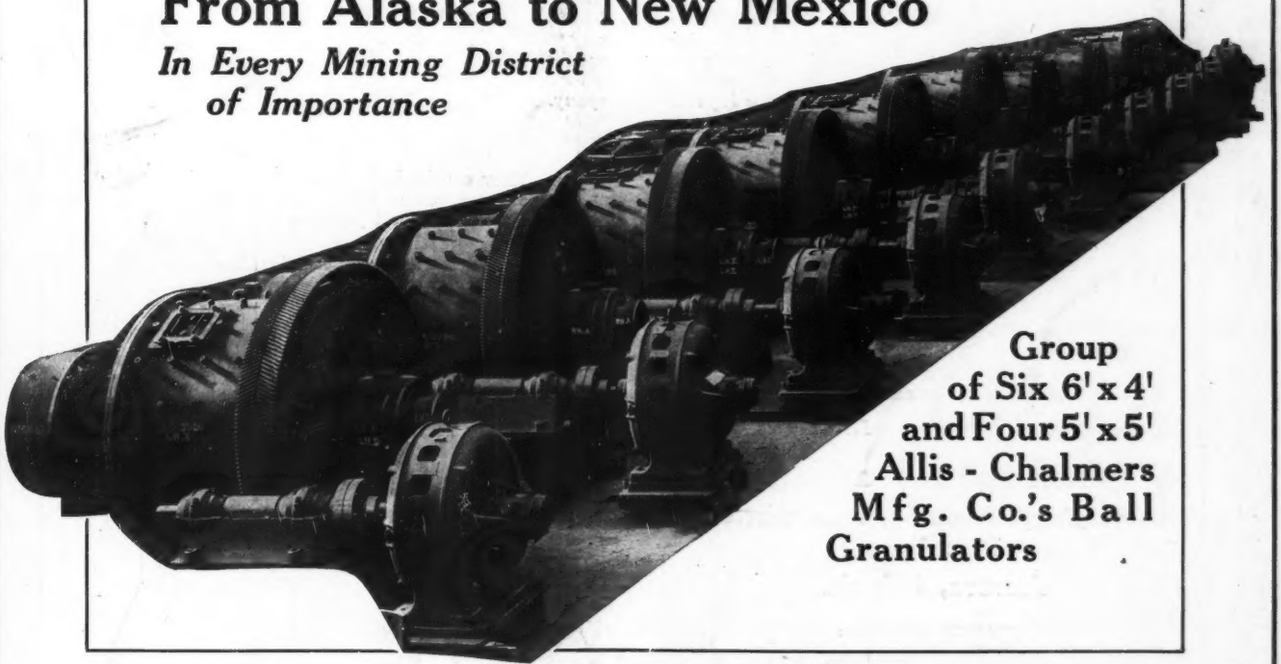

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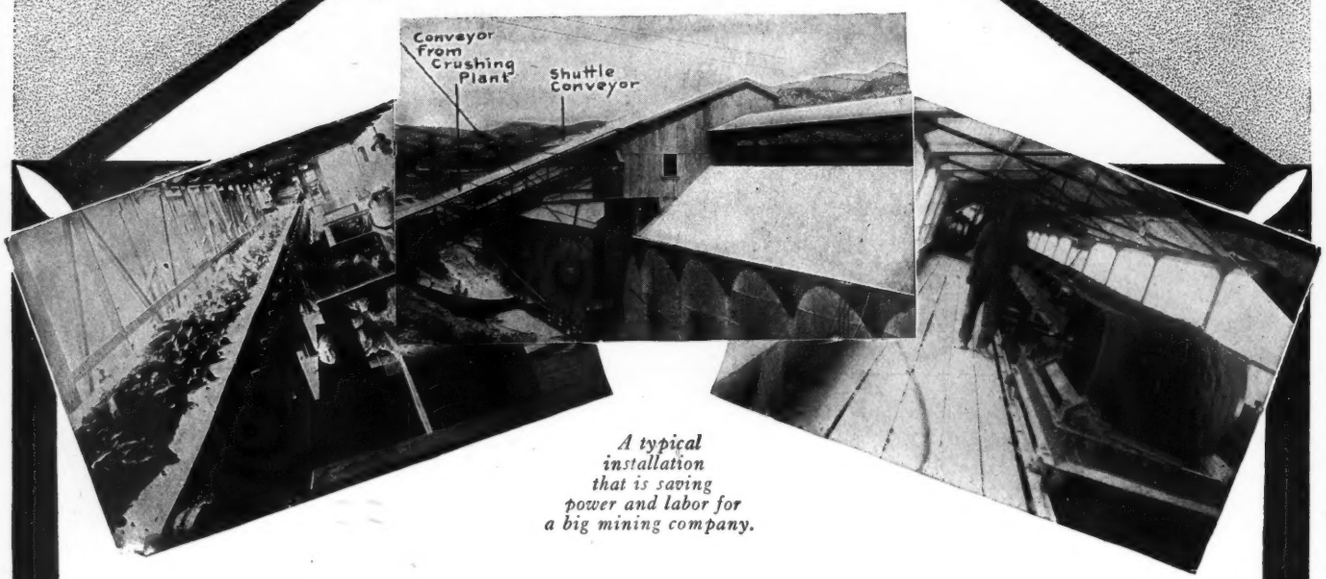

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Engineering and Mining Journal

April 12, 1919

Volume 107 *Number* 15

FIG. 1. A CORNER IN A MODERN SAMPLING PLANT, SHOWING AN AUTOMATICALLY OPERATED MULLER FOR BUCKING ASSAY SAMPLES

Sampling Practice at Independence Mill

By CLAUDE T. RICE

A detailed description of the plant and the methods of sampling at one of the newer mills of the Cripple Creek district of Colorado. Accuracy is increased by the elimination, as far as practicable, of the personal element and the substitution of automatic appliances of proved efficiency. Several interesting features are mentioned, including a mechanical bucking apparatus and a sample mixer and divider, both of which devices have proved satisfactory for the final handling of the pulp.

THE Independence mill, at Victor, Colo., was built by the Portland Gold Mining Co. to treat a considerable tonnage of custom ore, and an excellent sampling plant was incorporated in the design. The receiving bins are arranged side by side at the head of the coarse-crushing building, and consist of six 150-ton and six 75-ton hopper bins, over which run a track connecting with the narrow-gage system of the district, and a 24-in. track that serves the mine. The ore is crushed to 1-in. size before going to the bucket elevator serving the sampling mill—first in No. 7½ D Gates crushers to 2½-in. and then in Garfield rolls to 1-in.

At the head of the sampling mill is a small hopper bin of sufficient size to permit the remainder of the system to be cleared of ore before shutting down, in case some part of the crushing plant suddenly causes trouble, as well as to provide sufficient ore to insure regular feed through the sampling mill. The sample is taken by Vezin cutters, four in number, each of which takes a one-fifth cut. The first two of these machines are fitted with two wings, whereas the latter two have four wings each. Between each sampling the ore is crushed in rolls, being fed to them by a shaking tray feeder so as to get a thorough mixing of the pulp between samplings. The last pair of rolls has the faces set almost in contact, giving a nominal ⅛-in. product.

The final cut at the sampling mill is caught in an iron sample buggy such as is shown in Fig. 2, in which it is moved about the plant or stored until the sampling results have been accepted by the shipper. Present sampling practice at the Independence mill provides for ores that assay $4 or less a ton. For that reason it is not essential to mix the sample so carefully as would be required if a $20 ore was being handled, as at the Golden Cycle mill. This also enables a satisfactory sampling of the shipment to be obtained when cutting out only a 1-625th as the final bulk sample, even if there is a tendency for the gold-carrying minerals to go to the fine sizes. The third of the pulp that has been crushed the

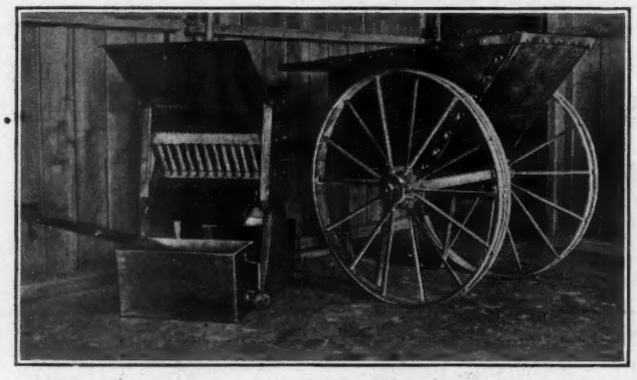


FIG. 2. JONES SPLITTER AND SAMPLE BUGGY

finest always carries at least two-thirds of the gold in a Cripple Creek ore, so that one-fifth is taken as the sample at each cutting down of the pulp and the sampler is run at as high a speed as is consistent with satisfactory results. Especially when the ore has been crushed to ¼-in. size and finer does the segregation of the gold into the fine pulp become markedly noticeable; and it is on that account that the last two Vezins are made with four wings, instead of with two, as is customary.

The sample, which, as it comes from the mill, has, with the exception of balls of clay gouge, been crushed so that all will pass a 4-mesh and 50% a 10-mesh screen, is taken to the plate room in the buggy in which it has been caught. There the sample is dumped on the floor, and all balls of clay or talc are chopped down to 4-mesh before it is mixed for final bulk splitting on the Jones splitter. This consists in distributing the sample, a shovelful at a time, into four pans. These are made of sheet iron, with the handles riveted on vertically (see Fig. 2), thus making it easier to pour the ore from them upon the splitter in a regular and even stream. As these pans hold about 80 lb. when full, four pans are usually ample. But in case that number should prove insufficient, the contents of the four pans are poured over the splitter and then the remainder of the original sample is shoveled into the four pans and this last portion of the sample split down and added to the rest before any of the pulp is cut down a second time.

The Jones Splitter Insures Accuracy

No other mixing is necessary. Before any of the pulp is cut down, all reject from the previous split is returned to the original sample buggy for holding until acceptance of the sampling. This insures freedom from mix-ups. To minimize the possibility that inequalities present in the construction of the splitter may vitiate the results of the sampling, the rejection is taken first from one and then from the other side of the machine in splitting down custom ores. But as testing has shown this to be unnecessary to insure accuracy of sampling, and it is now resorted to merely to avoid any possibility of criticism by the shipper, this practice is not followed in the case of company ore; for, when it is not done, the sample can be split down more rapidly and with less work.

The final reduction is done in two small rooms partitioned off at one corner of the roll floor of the coarse-crusher building. To make the rooms as dust proof as possible they are built with double walls, paper being placed between as lining. Ample windows provide plenty of light and, in addition, remove any appear-

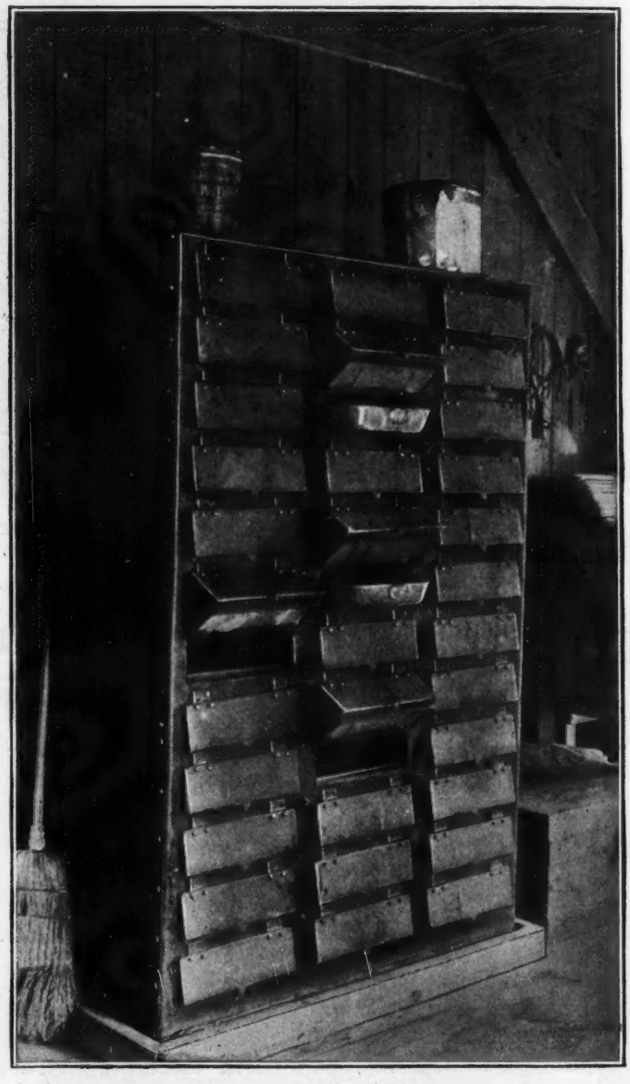


FIG. 3. SAMPLE DRIER

ance of secrecy in the sampling. To facilitate shoveling and cleaning, the floor of the plate room is covered with turn sheets. Compressed air at 30 lb. per sq. in. is used in cleaning up the rooms and apparatus.

The bulk sample from the mill is split on the Jones splitter shown in Fig. 2. This consists of a cast-iron piece composed of 24 sections, each ¾ in. wide, that is carried from 1-in. board end-pieces on wheels so that it

can be moved about the plate room conveniently. A sheet-iron hopper feeds the pulp evenly over the top of the riffle-casting. Sheet-iron doors confine the dust as it rises from the pulp, yet permit easy access to both sets of channels in case a large piece of ore may jam in them. This splitter is made so as to halve the pulp each time that the sample is poured over it, and the cutting down of the sample is continued until the pulp is brought down to between 4 and 8 pounds.

Reject Sample Is Held in Buggy

The reject is then properly labeled and wheeled to one end of the plate room, where it is held in the original buggy until the sampling is accepted by the shipper. A 5-lb. moisture sample is taken from the reject, which, after having been dried, is returned to the buggy.

The samples are poured into enameled iron pans in the bucking room and properly labeled. On these labels the company's lot number, the shipper's name, the shipper's lot number, the car number in which the shipment arrived at the mill, the number of the bin in which the shipment was stored, and the time at which the ore was sampled are given. Later, the times when the material is put into the drier and the grinder, and when it is made up into a 20-oz. sample and sent to the Coard mixer and divider are added. A complete history of the sample is therefore recorded on the tag which accompanies it.

A Usually Neglected Feature of a Sampling Plant Has Received Proper Attention

In Fig. 3 is shown the drier. This consists of a cast-iron front with sheet-iron sides in which are a series of steam coils forming 12 shelves, each of which will carry three samples. It will be noted that these doors are cast so that the bottom rim of the door above will catch upon the nose tip of the door below and thus hold it open —a convenient arrangement. The coils are heated by steam under a pressure of 15 lb. per sq. in. Usually the samples are allowed to dry overnight before being ground to 120-mesh. Enameled iron pans are used in handling the pulps in the bucking room, because they are much more easily cleaned than ordinary iron pans. The moisture sample is weighed as soon as it has been dried and the assay sample is sent on to the pulverizer for fine-grinding before being split down to final size of 20 ounces.

In the McCool pulverizer practically the whole sample is reduced to 120-mesh, and little subsequent grinding is necessary. The machine will grind a 6-lb. sample in about half an hour, after which it is thoroughly mixed by being poured from one pan to another. Then it is split by a small Jones splitter and adjusted by spatula so as to bring the weight of the final sample exactly to 20 oz. This is then passed through a 120-mesh screen. Less than an ounce will remain as oversize, and this is then bucked down on the King-Stanwood gravity muller shown in Fig. 1.

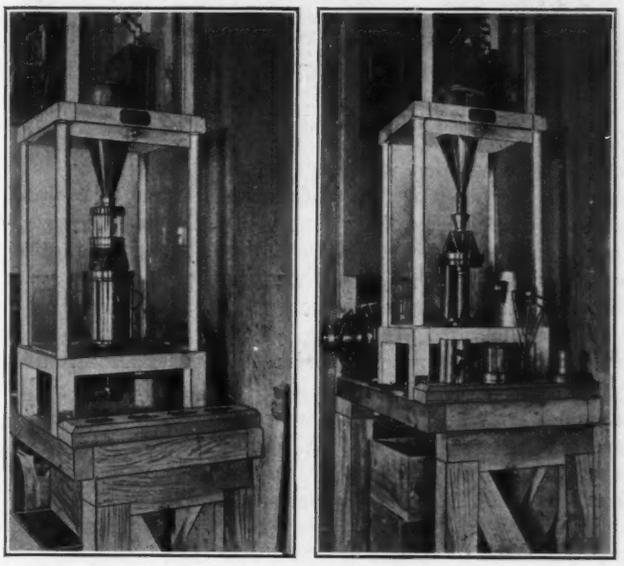
The King-Stanwood Mechanical Bucker

This simple and efficient device consists of a muller operated by a crank rod from the driving disk of the machine. On the raising and lowering of the connecting rod, the muller is given a rocking motion that simulates closely that imparted in hand bucking. A lever is provided for raising it while the pulp is being swept off the plate. The drive shaft is run at 60 r.p.m. by the same 5-hp. motor that drives the pulverizer. As the oversize from the 20-oz. final sample weighs less than 1 oz., it takes only a minute or two to grind it down to size with the gravity muller. This device is made by the Hassel Iron Works, Colorado Springs, Colorado.

The ground oversize is put through the 120-mesh screen and added to the rest of the sample, which is then poured into the hopper cone of the Coard mixer and divided. There the final sample is mechanically mixed and divided into four parts.

The Coard Mixer and Divider

The Coard mixer and divider (Figs. 4 and 5) is an excellent device, for not only is it a time-saver, but its use also insures freedom from any suspicion of partiality in the splitting of the final sample. This is an important point when any marked segregation of the valuable minerals results from fine-grinding. When



FIGS. 4 AND 5. COARD MIXER AND DIVIDER

the quartering method is used, an expert sampler can dishonestly manipulate a number of types of samples in an effective manner during the final quartering and splitting operation if he so desires. As the Coard mixer and divider is entirely automatic in operation, can be cleaned quickly after each sample is put through it, and is so constructed that it requires little attention to keep it in perfect running order, it deserves special mention. The war has delayed its manufacture, and, up to date, the machines have been made by hand, and consequently only a few are in use. Now that the war is over, the inventor, A. J. Coard, of Colorado Springs, who was formerly in charge of the sampling at the Portland mill, intends to begin to put them on the market in quantity sufficient to supply the demand.

Mixer and Divider Operations

The Coard mixer and divider is shown assembled in Fig. 4. In Fig. 5, it is shown taken apart as for cleaning. It consists of a mixing cone in which rotates a mixer that ends in a feed screw at the bottom, as can be seen in Fig. 5. From this mixing hopper the pulp is fed on to the slightly concaved base of an inverted cone that rotates at 600 r.p.m. From this cone the pulp

is thrown, by centrifugal force, against the sides of a glass cylinder, and falls down into a stationary splitter that divides the pulp into four approximately equal parts. These four samples then feed through spouts down into the hoppers of the sample-cup spider, which rotates at 200 r.p.m. in an opposite direction to that of the cone, and which carries four cups that receive the final samples. The control samples are poured from the

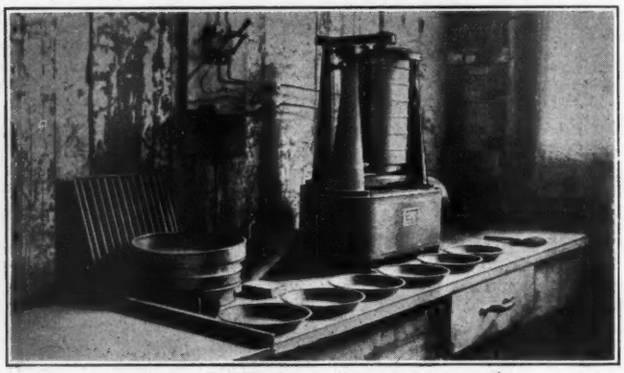


FIG. 6. RO-TAP SCREENING DEVICE

cups into envelopes, which are properly labeled and then sealed. An attempt was made to design the mixer and divider so that the four controls would be caught directly in the envelopes and sealed without any handling of the pulps by the person assigned to the work, but that was found impracticable.

The device is contained in a glass case to protect it from dust. A ½-hp. motor drives the mixer and divider, which, owing to its design and construction, is easily taken apart and cleaned by compressed air after a sample has been put through it. The device has been in use for several years under the severest of tests, and has been found thoroughly satisfactory.

Probably no ore except one containing metallics is more difficult to sample and to divide than is the higher-grade Cripple Creek ore. The tellurides are rich in gold, and, in the crushing of the ore, they invariably break up considerably, with the result that the bulk of the gold is scattered through the pulp in the form of minute particles of rich telluride.

Mechanical Screening Adopted in the Laboratory For Screening Dried Mill Samples

In Fig. 6 is shown the Ro-Tap screen made by the Tyler Company, used in the cyanide laboratory of the Independence mill for screening the mill samples after they have been dried. On pulps resulting from fine-grinding of ore from the Independence and Portland mines and dumps, this screen works admirably. But there are certain ores, for instance this very Cripple Creek ore after it has been roasted, which will not screen properly when dry. In such cases a Ro-Tap or any similar device is not satisfactory. At the Independence mill the time necessary for putting the dry pulp through the series of screens has been found by testing, and an allowance made for safety. At stated intervals the Ro-Tap is stopped, and the washers used on the different screens are changed from one side of the pans to the other, so as to vary their paths of travel, and thus insure thorough rolling of the pulp on the different screen surfaces.

The Future of Geo-Chemistry*

Speaking recently at a joint meeting of the Liverpool Section of the Society of Chemical Industry and the Liverpool Geological Society, H. W. Greenwood said that, to the geo-chemist, every rock might be regarded as one of many components. Every change involved a change of equilibrium. In the study of these changes lay the province of the geo-chemist. The author referred to the work of van't Hoff, Liebig, and others, in the study of geo-chemistry and mineralogy, and of American investigators of recent times. They had proved that research paid, and paid handsomely. Reference was made to potash as a substance to which attention was now being drawn, and of the values of furnace dust as a source of potash. It was clear, Mr. Greenwood said, that much of the future supply of potash must come from furnace dust. Of 35,000 tons of potash required per annum, it was estimated that 15,000 tons could be obtained from the furnaces of Great Britain. That was a low estimate, and it should not be difficult to double it by the methods invented by Kenneth Chance. Regarding feldspars, the speaker thought it a waste of time to deal with these, when thousands of tons of potash could be extracted as byproducts from present industries. As a source of potash alone the feldspar industry had no future whatever.

Noting, in passing, Indian and Italian sources of materials from which potash could be obtained, the lecturer next referred to the large deposits of volcanic lavas. He thought that in these deposits there was a field that would pay for chemical investigation, and that further experiments should be performed. The work could be carried out in electric furnaces. If the methods proved feasible, it would then be possible to prepare silicates of known quality; and the information gained would be of great use to the ceramic industries, and would possibly be the means of utilizing vast quantities of material which were not now available, in those industries, owing to deleterious matter. All of the scientific work of those industries lay in geo-chemical investigation.

Refractories for furnace work were to be obtained, Mr. Greenwood declared, but it was different when the question of high-temperature research and investigation was approached. Modern methods of metallurgy demanded control of a totally different character from that of the past. He alluded to zirconium, tungsten, and corundum as valuable refractories. Investigations of these were, however, wanted, because furnace work in the future would depend on possessing the perfect refractory.

Speaking of the distillation of coal and shales, Mr. Greenwood said that, in 1918, it was found possible, on results obtained by the Glover-West retorts, to obtain a valuable fuel oil for use by the navy. It was most important that a supply of fuel oil not only for the navy, but for the mercantile marine, and for other uses, should be obtained from that source. It seemed to him that a more progressive policy of research was called for in that direction and in other directions also. It was well known that some of the bituminous shales had been found to yield as much as 30 gal. of oil per ton. The bituminous beds in Yorkshire yielded considerable amounts of shale, and it would be desirable to direct attention to the question of recovering the oil contained.

*Abstracted from the *Chemical Trade Journal and Chemical Engineer*, Jan. 18, 1919, p. 50.

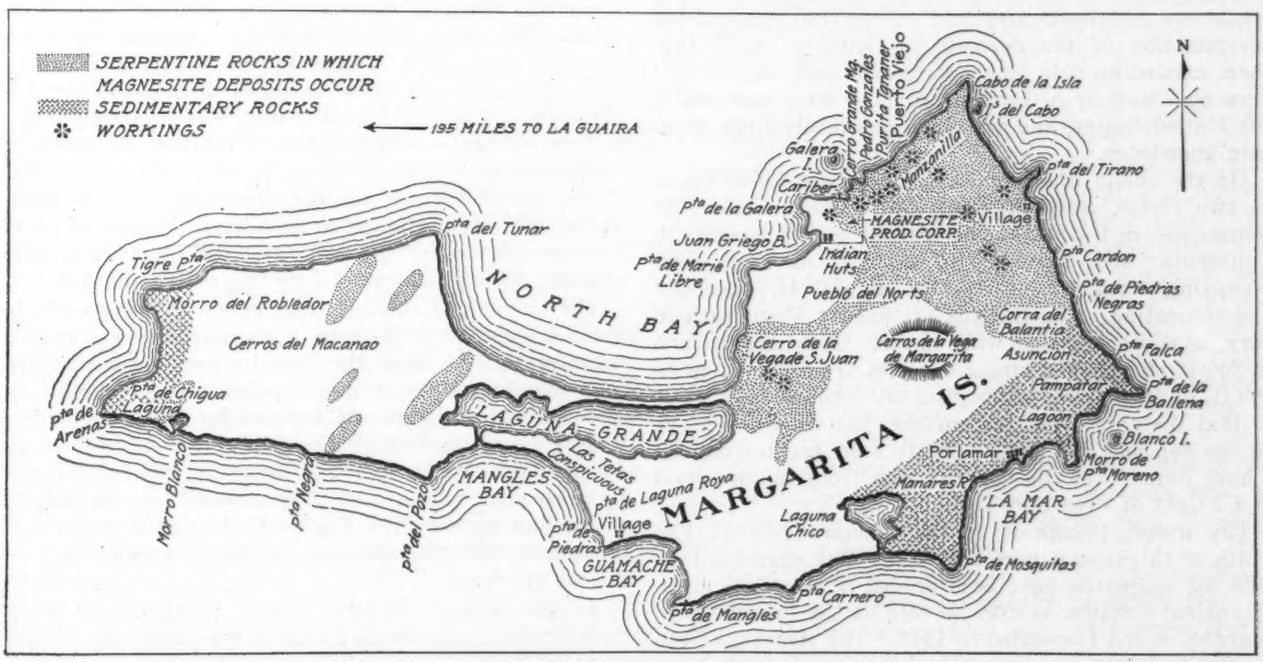
Magnesite on the Island of Margarita

By CHARLES F. Z. CARACRISTI*

Magnesite is an important industrial mineral, and the presence of large deposits of it accessible to ocean transportation is of considerable interest. Little success has attended the efforts to exploit these deposits, and whether magnesite can be produced from them in competition with other sources of supply at present is open to question.

THE growth of the market for magnesite in recent years has stimulated prospecting for this mineral in many parts of the world. The shortage of ships and the consequent lack of tonnage space due to the war have not only made importations from Greece, formerly one of the principal sources of American supply, impossible, but also prevented the working of the considerable magnesite deposits of the island of Margarita, Venezuela.

The island of Margarita is geologically a post-Eocene intrusion. It lies 11 miles north of continental Venezuela and 190 miles northeasterly from the port of La Guayra and is, in reality, two islands connected by a sand strip. An examination has convinced me that the two islands were formed at approximately the same geological time and that they were eventually connected by coral beds, which are now covered with sand and a soft tufa composed of limestone, silica, and iron oxide, together with cemented gravel and other shore wash. The western part of the island is known as Macanao, and contains an area of 110 square miles; the eastern section, or Margarita proper, contains 272 square miles. The neck connecting the two has an area of 36 square miles. It has a maximum length from east to west, following latitude 11° N., of 34 miles and a width of 16 miles from north to south. Although the island of Margarita was first occupied by the conquerers, and settlement began in 1520, there exists no map of the territory except the outline charts of the navies of the world based on the old Spanish data, slightly revised but as a whole, incorrect. The government of Venezuela is now compiling a map, but as it is not based on an actual survey it will have little value. The Cerro de la Vega Mountain, reaching an altitude of nearly 10,000 ft., is in Margarita proper. The Cerro de San Francisco Mountain is in Macanao, and reaches an altitude of 7210 ft. There are many other high peaks on the island. The census of the island gives 70,000 inhabitants, but I am of the opinion that 50,000 is probably nearer the actual figure. I estimate that Macanao has less than 1200 inhabitants, and, owing to the fact that they live entirely in towns and villages, the greater part of the area of the island being mountainous, it is probable that 90% of the population occupies less than 75 square miles. The island is barren, and rain is not abundant. Sometimes three years pass without rain enough to develop a crop, and even drinking water is scarce.



MARGARITA ISLAND
From a U. S. Hydrographic Survey Map

All of the island except the area lying to the southeast and embraced by a line drawn from Piedras Negra Point to the northwestern extremity of the salt water lake known as Laguna Chica on the U. S. Hydrographic Survey map, shown on this page, and the western extremity of Macanao, is composed of basic igneous rocks, peridotite, pyroxenite, dunite, serpentine, talc, diorite, andesite, amphibole and a schistose rock that I have not been able to classify definitely. The amphibole, serpentines, soapstones and talcs, with their associate minerals, pargasite, asbestos, actinolite and chromite

*Geologist and consulting mining engineer, Macuto, Venezuela.

in small quantities, are associated with wolchonskoite and other chrome ochers, and magnesite.

The line of contact between the igneous intrusions and what appear to be the upper Cretaceous sedimentary beds, forming the apex of a northeast and southwest anticline, is a siliceous limestone crystallized into a compact gray marble. This anticline is traceable from Point Piedras to Laguna Chica, a distance of 11 miles in a straight line. It is well defined, and the formation that lies to the south of and parallel to it consists of soft limestone, lignitic shales, and transition beds. The shales are exposed and can be best studied on the seashore at the Port of Pompatar.

At the extreme western end of the island, known as Macanao, metamorphic shales are found, but I am not certain whether these shales are of sedimentary or igneous origin. I am led to refer to them as metamorphic because, at a point, Boca Chica, at Punta Arenas, I found, in 1916, petroleum seepage, and also owing to the fact that to the east in the mountains I found what appears to be the contact with the basic igneous rocks forming San Francisco peak in the Macanao uplift. The seepage seems to offer hope that petroleum may be developed at or near this point.

Minerals of Economic Importance

The only minerals of economic value found on the island are magnesite and talc. When I undertook the investigation of the deposits, in 1916, I found that there existed no data on the subject except such as had been published by a German promoter who operated in the United States, and who had apparently little accurate knowledge.

On the island of Margarita, the magnesite is found in two forms, first, in veins and seams, usually not continuous, in the serpentine, similar to the deposits in California; and, secondly, in deposits of large area occupying troughs composed of amphibole, pargasite and serpentine. The troughs are usually V-shaped and vary in width between wide limits. They are from 5 to 200 ft. deep. The larger deposits are assumed to be 200 ft. in depth, although no excavations have been made to that distance from the surface, but some workings on the deposits and tests indicate even greater depths. I have found that the deposits rise from the sea level to a height of over 1000 feet.

The widest trough is at the Maneiro ranch. The width of the deposit here is 284 ft. The channels that hold the magnesite have been eroded in the basic rocks by ancient streams, as may be seen at the Puerto Viejo quarries, which I operated in 1917. The removal of the magnesite leaves an opening such as would result from erosion by water, and the mineral does not follow the crevices caused by the cooling of the igneous rocks, as might be expected had the magnesite been formed prior to the troughs. Also, at the bottom of the magnesite, at the quarry known as the Manzanillo, I found, on the contact with the amphibole, water-worn gravel made up of peridotite and some opal. The magnesite found in these troughs consists of a honeycomb interlacing of seams that invariably inclose a fine sand. It is mechanically inclosed within the magnesite, as has been shown by the microscopic examination of hundreds of samples and by analyses. At one point, known as Risgo quarry, at Puerto Viejo, the sand contains considerable iron oxide, and it has formed a hard concrete that disintegrates on exposure to the atmosphere. The sand inclosed is usually fine enough to pass a screen of from 80 to 100 mesh. The sands contain less than 4% magnesia, 11% alumina and in rare cases lime varying from one-half of 1% to 2%. I have found at the quarry known as La Plata, at Puerto Viejo, as much as 2% of Cr_2O_3, but this was in a few exceptional cases. There is little doubt that the magnesite was deposited in the troughs subsequent to their formation. The precipitation of the magnesium carbonate was probably due to the magnesia-laden waters coming in contact with the carbon dioxide liberated by decomposing organic matter.

There is no doubt that the mountainous region on the slopes of which the magnesite is found has lost much of its height through erosion. Though the magnesite itself is of characteristic hardness, it has been the practice to work it with picks, owing to the fact that the walls of the stockwork are usually thin and offer little resistance. Associated with the serpentine at various points I found outcroppings of arfvedsonite carrying a high percentage of soda, as much as 20% in one instance and as low as 4% in another; also actinolite and anthophyllite, the latter carrying 25% magnesia and 51% silica. These conditions are general and refer to the Juan Griego-Mata Siete belt, which covers the northeastern portion of the island, and apply to all the deposits that exist in association with sand and refilled superficial channels that were untouched by the igneous flows. The probability is that the carbonate of magnesia is genetically related to the breaking down of the serpentine and other silicates of magnesia. The presence of soda and iron found in the anthophyllite and arfvedsonite might also have assisted the work of decomposition. I probably should not have stated that "these conditions are general," because they are modified by the substitution of inclosed clays in place of sand, but the analysis of the sand and the clay varies only slightly, the clay carrying lime in greater quantities.

The troughs or channels that carry the magnesite in many instances radiate from the center of the mountain cones or peaks. Thus the deposits are like the spokes of a wheel, and the principal peaks are the centers or hubs. However, the general topography of the region has undergone a marked change since the deposits were formed; but this change was caused by erosion and not by subsequent movements. These conditions are notable at the San Jose, Triano, Pueblo Viejo, and Maneiro outcroppings. In the mountains of San Juan similar conditions are found.

At the village of Alta Gracia, northeast of Juan Griego, the magnesite is found under conditions almost identical with those existing in the Deer Creek deposits of Tulare County, Calif. A 4½-ft. vein has been opened under my direction, and appears to extend for a distance of 3000 ft., cutting across a mountain known as the Cerro Grande. The magnesite is found on the contact between decomposed serpentine and amphibole. The prospecting work done was not sufficient to justify me in making a definite statement as to the exact size of this particular deposit.

The Alta Gracia-Pedro Gonzalez deposits, known as the Cerro Grande group of prospects, have a supply of magnesite in vein form of approximately 420,000 tons, according to estimates made by Dr. Amadoe Hernandez, Venezulean government engineer. My own estimate, however, is far below this figure.

It is practically certain that these deposits will not

be developed so long as the magnesite previously described is available, because of the lower cost of mining the trough deposits in comparison with the higher cost of mining the magnesite found in veins and stockworks.

Estimated Quantity

I estimate the supply of magnesite on the island of Margarita to be distributed about as follows:

	Tons
Cerro Grande deposits, including Pedro Gonzales	300,000
Pueblo Viejo-El Taque deposits	200,000
Manzanillo-Estacia-Mata Siete deposits	700,000
Tirano-Asuncion deposits	250,000
San Juan deposits	400,000
Macanao deposits (approximated)	350,000
Total estimated supply	3,200,000

The methods of mining the magnesite used up to the present have been of the most primitive type—pick, shovels, and wheelbarrows. It must be remembered, however, that the work accomplished has been mostly for the benefit of the promoters and the local management. In a country that has practically no skilled labor, the less machinery introduced the better; that is, unless the work is to be carried out on a large scale, such as will justify the bringing in of foreign mechanics and miners. The most important property on the island, known as Estacia, recently purchased by a New York company, as well as other deposits in the region covered by the Manzanillo-Estacia-Mata Siete group, can be successfully operated by the use of steam shovels. The deposits of the Pueblo Viejo and Tirano groups that lie near the Caribbean Sea can probably be cheaply operated by the hydraulic system, using salt water for the purpose. The hydraulic system cannot be applied in the quarries in the interior of the island, because of the scarcity of water. The steam shovel and the use of screens are next lowest in cost of operation.

Costs and Analyses

The experimental work which I conducted at Pueblo Viejo proved that, at that particular point, the cost of production of magnesite ready for shipment was $3.15 per metric ton. This was by hand work. At other points the cost was only $1.80, but both estimates included the cost of stripping the quarries. This expense should and can be reduced to $1 per ton at the quarry by operating with machinery and on a large scale.

An analysis of samples taken at Alta Gracia gave the following:

	Per Cent.
Magnesia (MgO)	47.13
Carbon dioxide (CO_2)	51.08
Lime (CaO)	0.22
Ferric oxide (F_2O_3)	0.38
Silica (SiO_2)	0.26
Alumina oxide (Al_2O_3)	0.70
	99.77

One sample taken from the Alta Gracia vein gave 2.23% sodium carbonate; another contained 0.37% of potash, and still another gave the surprising result of 51.88% MgO. This test was made in Virginia, in 1915, and I was at a loss to learn where the error was, but found when I examined the property that the magnesite in spots was filled with shot-like concretions. These on examination proved to be magnesium oxide. As under the microscope these concretions showed iron stains, and analyses gave 4% ferrous carbonate (not Fe_2O_3), I am inclined to believe that the difference was due to the chemical change brought about by the iron carbonate.

The average of a number of analyses in the Pueblo Viejo belt gave the following:

	Per Cent.
Magnesia (MgO)	46.71
Carbon dioxide (CO_2)	51.18
Lime (CaO)	0.05
Ferric oxide (Fe_2O_3)	0.26
Silica (SiO_2)	0.30
Alumina (Al_2O_3)	0.09
	98.59

The average of 62 analyses of the Estancia prospect gave:

	Per Cent.
Magnesia (MgO)	47.68
Carbon dioxide (CO_2)	50.98
Lime (CaO)	0.07
Ferric oxide (Fe_2O_3)	0.19
Silica (SiO_2)	0.24
Alumina (Al_2O_3)	0.15
	99.31

There is little doubt as to the value of the magnesite deposits of the island of Margarita, but the operation of the mines depends upon the ability of the Venezuelan government to control certain influences that dominate the local courts of the island. To this end General Gomez, the president, is said to be devoting his attention, and it is probable that he will succeed in eliminating the impediments that have interfered with the development of the magnesite industry. The cessation of operations by the only two companies working mines on the island, owing to local difficulties, has thrown 300 men out of employment and injured some American interests.

Auxiliary Power-Plant Requirements*

In steam plants power is required for running a number of auxiliaries, such as coal-handling apparatus, stokers, boiler-feed pumps, and circulating pumps. The methods used for obtaining this power are determined as a compromise between reliability, convenience, thermal economy, and financial economy. A careful consideration of all the methods warrants the following conclusions:

1. The smallest thermal cost for auxiliary power is incurred when generated by steam with complete absorption of the exhaust in the feed water.

2. The greatest possible part of all of the auxiliary energy required can be obtained in this way when the steam drives used with the auxiliaries have the greatest possible thermal efficiency.

3. Auxiliary power in excess of that obtainable with exhaust steam absorption can be procured from the main generators in electrical form at a lower thermal cost than in any other way.

To these conclusions may now be added two commonly known facts:

1. The increasing price of fuel is leading more central stations to the use of economizers.

2. The greatest saving is effected with economizers when the water supplied them is at the lowest permissible temperature. This value is probably somewhere between 120° and 150° F., depending upon the type of economizer used and the degree of care with which it is operated.

Because the Hostilities Are Over do not shift into careless spending, but thrift forward into wise saving. Buy W. S. S.

*Abstracted from Technical Paper 204, "Economical Operation of Steam Turbo-Electric Stations," Bureau of Mines, Department of the Interior.

Sources of Basic Refractories*

BY J. SPOTTS McDOWELL AND RAYMOND M. HOWE

MAGNESITE is an important refractory in openhearth, heating, and electric furnaces for steel making and in many of those employed in the metallurgy of copper and lead. It is sold in the form of brick, finely ground "furnace magnesite" for brick laying, and dead-burned grains for making and repairing furnace bottoms. The latter are a mixture of granules varying in size from pieces of about ⅝ in. diameter to fine but sandy particles. Dead-burned magnesite results from calcining the crude or lightly burned mineral at a temperature that will not merely drive off practically all the CO_2, but will also cause sintering of the particles. During this process the pieces shrink considerably and become hard, dense, and inert to atmospheric moisture and CO_2; under-burned material, on the other hand, will hydrate on exposure to the air. A small percentage of ferric oxide seems to be necessary for the production of a satisfactory sinter; from 4.5 to 8% in the dead-burned grains is considered the most desirable amount.

Dolomite has been little used for brick making in the United States, but it is prepared for use in the granular condition, calcined or "doubled-burned," and is the principal ingredient of several materials offered for sale under various trade names for refractory purposes. Dolomitic refractories are almost wholly confined to the openhearth and electric furnaces, where they are used for fettling and as substitutes for magnesite.

Much more magnesite and dolomite are used for basic openhearth steel making than for all other refractory purposes. The hearth of the furnace is usually built up of magnesite brick and dead-burned grain magnesite, so laid that the brick base is protected by a working bottom of the granular material. The latter is sintered into place in layers ½ to 1 in. thick to a total depth of 12 to 18 in. at the center of the furnace. After each heat, burned dolomite is thrown against the banks as high as it will stick, and all holes in the bottom are filled. At most plants such holes, at the end of each week, are also carefully filled with dead-burned grain magnesite. For temporary patching, dolomite is generally used, as it sets more quickly than is the case with magnesite and its first cost is less.

Prior to 1914, the world's supply of refractory magnesite came almost wholly from the crystalline deposits of Austria-Hungary. Its superiority lies in its high refractoriness and long range of vitrification, which enable it to frit together at high temperatures without fusion or excessive softening. These properties are imparted by a fairly high content of iron oxide, together with an extremely low percentage of harmful impurities. The dead-burned Austrian magnesite sold in the United States had the following range of analysis: MgO, 83.7 to 87.3%; CaO, 1.9 to 3.9%; SiO_2, 1.1 to 4.1%; Fe_2O_3 and Al_2O_3, 4.7 to 8.6%. With the cessation of shipping from Austria, magnesite was imported from Greece and Canada, domestic deposits were developed, and, as a temporary expedient, dolomite was substituted for magnesite where practicable. The deposits of this country are now developed sufficiently so that an adequate supply is available and ample reserves are blocked out to last many years. Table I shows the great expansion of domestic production since 1914. All figures are reduced to a calcined basis, assuming 2 tons of crude magnesite equal to 1 ton of calcined.

TABLE I. TOTAL MAGNESITE CONSUMPTION OF UNITED STATES ON A CALCINED BASIS

Net Tons:	1913	1914	1915	1916	1917
Imported	173,719	128,494	51,458	46,941	19,093
Domestic	4,816	5,646	15,250	77,487	158,419
Total	178,535	134,140	66,708	124,428	177,512

At the beginning of the war, the refractory manufacturers were crippled by a lack of calcining facilities, because the Austrian material had been imported in the calcined condition. The low iron content of the available magnesite caused additional difficulties. To obtain the proper sintering and bonding properties, it became necessary to add iron oxide and to incorporate it thoroughly by burning at an extremely high temperature. Magnesite thus treated, if sufficiently low in harmful impurities, is a high-grade refractory and has given conspicuously satisfactory service.

GRECIAN DEPOSITS

The deposits of Greece are of the amorphous type, and had been operated on a large scale for many years, but their output was rapidly increased after the war began. A considerable amount of magnesite was imported from Greece in 1915 and 1916, but shipments were suspended late in the latter year. Much of the Grecian product is of exceptional purity, as shown by the accompanying typical analysis of crude rock, though some of the imported material was high in CaO and SiO_2, owing, doubtless, to improper selection at the mines. The percentage of impurities after calcination will be practically double these figures, an account of the loss of CO_2.

TABLE II. ANALYSES OF CRUDE MAGNESITE FROM GREECE

	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
SiO_2	0.67	0.46	1.19	1.63	2.28
Al_2O_3 and Fe_2O_3	0.30	0.50	0.43	1.36	0.19
CaO	0.92	1.24	0.80	1.44	1.56
MgO	46.06	46.22	45.83	45.75	44.78
Ignition loss	52.16	51.51	50.42	49.88	49.76
	100.11	99.93	98.67	100.06	98.57

The magnesite of the Greenville District, Quebec, is white to grayish, finely crystalline, and high in lime, due to dolomitic inclusions. Wilson[1], in 1917, estimated that there were in sight a little under 700,000 tons in the deposits of the district containing less than 12% lime (equivalent to over 20% lime when burned). It has been stated that when calcined and mixed with furnace slag or dead-burned with iron ore, the Canadian magnesite has given satisfactory service in furnace bottoms[2]. However, the leading refractory manufacturers prefer the purer mineral of California and Washington, and endeavor to maintain the CaO content below 4% in the dead-burned material. During the period of greatest scarcity of magnesite, the Canadian product was utilized by several companies in the manufacture of

*Abstracted from a paper presented at the New York meeting of the A. I. M. M. E., February, 1919.

[1]M. E. Wilson, "Magnesite Deposits of Greenville District, Quebec." Canadian Department of Mines, Memoir 98, 1917, p. 52.

[2]A. Stansfield, *Iron and Coal Trades Review*, Jan. 12, 1917, p. 31.

magnesia brick as a minor constituent of the mix, but this practice has probably been entirely abandoned. It is, however, being employed for the production of dead-burned grain magnesite, by sintering with iron oxide in rotary kilns.

California magnésite, which is of the amorphous type, is found at many places. It occurs in the form of veins, lenses, and stockwork in serpentine and the deposits are usually small. The largest and most important are those near Porterville, Tulare County, and St. Helena, Napa County. Prior to 1914, about 10,000 tons was being produced annually; hence the mines had not become sufficiently developed or equipped to produce large tonnages before the summer of 1916. Transportation was a serious problem in the rainy seasons, as nearly all of the deposits are a number of miles from the railroad, and hauling to the cars is done by means of trucks. Variations in quality at first caused the users considerable difficulty. It was often hard to keep the silica and lime contents within the proper limits, owing to the impurity of some deposits and the lack of uniformity in others, as well as to the common inexperience of the operators. Most of these difficulties were gradually lessened, and in 1917 the production had risen to 211,663 net tons of crude magnesite[3]. In the meantime, a considerable number of calcining plants had been erected near the mines, to give the rock a light burning before shipment. Since a loss in weight of about 50% occurs in this burning, a material saving in freight resulted. Recently the California production has fallen off, owing to the competition of the larger and less expensively operated deposits of Washington. The first analysis, which is uncommonly high in iron for magnesite of this type, is representative of a unique deposit near St. Helena, Napa County.

TABLE III. TYPICAL ANALYSES OF CALIFORNIAN CRUDE MAGNESITE

	Per Cent.	Per Cent.	Per Cent.	Per Cent.	Per Cent.
SiO_2	3.25	5.18	1.10	3.86	1.55
Fe_2O_3 and Al_2O_3	2.20	1.10	0.40	0.80	0.45
CaO	1.25	3.34	Trace	2.04	1.38
MgO	43.87	41.92	46.54	43.47	45.68
CO_2	49.53	48.78	51.20	49.48	50.97
	100.10	100.32	99.24	99.65	100.03

The magnesite deposits of Washington have become a most important factor in the market since their discovery in 1916. A total of 715 tons of crude rock was mined and shipped in the latter part of that year, and 105,175 tons was produced in 1917. The mineral is finely to coarsely crystalline, and shows many variations in color from white to gray, pink, red, and black. Mining is done by both open-quarry and underground methods. It is reported that diamond drilling at the Finch quarry of the Northwest Magnesite Co. has proved the existence of more than 1,000,000 tons, and that on more than one of the properties an estimate of 1,000,000 tons within 200 ft. of the surface is reasonable[4]. Prior to the erection of calcining plants at the properties, many thousand tons of crude rock had been shipped in which the silica content was uniformly below 3.5% and lime less than 1.5%. The analyses given herewith are typical.

Calcination is now being done near the quarries, and dead-burned magnesite for refractory use to which iron oxide is added during manufacture is being produced in rotary kilns. The material as marketed by one producer has the following average analysis: MgO, 82.5%; CaO, 3.4%; SiO_2, 6.5%; Fe_2O_3 and Al_2O_3, 7.25%; loss on ignition, 0.5 per cent.

For many years prior to the war few basic bottoms in America had been built of dolomite, which was little used except for temporary patching and the fettling between heats. Since 1914, however, calcined dolomite and specially prepared dolomitic materials have been common substitutes for magnesite, being placed in the furnace in the same manner as the grain magnesite. Within recent months the tendency on the part of steel makers has been to displace burned dolomite by specially prepared dolomites for the temporary patching and to return to the use of high-grade magnesite for all original installations and major repairs.

TABLE IV. TYPICAL ANALYSES OF WASHINGTON MAGNESITE

	Per Cent.	Per Cent.	Per Cent.	Per Cent.
SiO_2	1.9	3.3	4.3	0.6
Fe_2O_3 and Al_2O_3	1.0	1.0	0.8	1.2
CaO	1.7	1.4	1.1	0.5
MgO	45.2	44.8	45.0	46.4
CO_2	49.7	49.3	49.5	51.0
	99.5	99.8	100.7	99.7

In the calcination of dolomite either vertical or rotary kilns may be used. In the latter case the rock is usually crushed to pass approximately a $\frac{3}{8}$-in. screen, the fine powder screened out, and the granules burned. It is usually held that for best results the heat applied must be sufficiently intense not merely to drive off the CO_2, but to cause the pieces to shrink and become hard and dense. The rock is frequently "double-burned" by being heated in one kiln merely high enough to drive off most of the CO_2, and further shrunk in a second at a higher temperature. The usual range of composition of the crude rock is CaO, 28 to 35%; MgO, 14 to 20%; SiO_2, 1 to 7%; Al_2O_3, 0 to 4%; Fe_2O_3, 0.5 to 5%; CO_2, 43 to 46%. As high a magnesia content as possible is considered desirable.

Burned dolomite, as ordinarily prepared, air-slakes readily, on account of the high percentage of lime. For that reason it cannot be kept in stock for long, without deterioration, and should be made just before use. A dolomite bottom is likely to show considerable slaking after a shut-down of even comparatively brief duration. Dolomite does not set as solidly as magnesite, so that patches of a dolomite bottom are more likely to become detached and float in the bath.

Special Dolomitic Refractories

Within the last few years, numerous investigations have been undertaken in the attempt to overcome the marked slaking properties and other defects of calcined dolomite. As a result several articles consisting of specially prepared dolomite have been placed on the market under various trade names, some of which are superior to ordinary calcined dolomite, being more resistant to atmospheric slaking and giving better service in the furnace. In most of these preparations the granules are coated or impregnated with pulverized basic slag, iron ore, or similar material by burning at a high temperature in a rotary kiln. The attempt has likewise been made to coat the crushed rock with a pulverized slag suspension in water, so that upon burning a protective coating will be formed on the surface[5]. In other cases the slaking properties are diminished by using an impure dolomite, preferably one high in iron. The analysis considered most desirable may be obtained by mixing raw rock of different compositions.

[3] C. G. Yale and R. W. Stone, "Magnesite in 1917." Mineral Resources of the United States, 1917, Part II, p. 65.

[4] Yale and Stone: *Op. cit.*

[5] A. V. Bleininger, "Some Aspects of the Testing of Refractories." *Proc.* Eng. Soc. Western Penn., 1916-1917, Vol. 32, p. 612.

One patented material is prepared by grinding together dolomite and iron ore to form an intimate mixture and calcining at a temperature reported to exceed 2850° F. (1565° C.). The finished product for furnace bottoms is said to show the following range of analysis: CaO, 42 to 55%; MgO, 38 to 25%; SiO_2, 6 to 13%; Fe_2O_3 and Al_2O_3, 8 to 14 per cent.

Another compound consists of an intimate mixture of granular dolomite and about 10% basic openhearth slag. The manufacturers prefer hard, compact and dense varieties of dolomite, as high as possible in magnesia. It is said that the granules, after calcination in a rotary kiln at about 2800° F. (1540° C.), are mixed, upon coming from the kiln and while still hot, with the granulated slag and the mixture is sent through a rotary cooler. It is claimed by the manufacturers that material thus prepared may be transported without slaking when the magnesia content is high and the dolomite is extremely hard burned. The average analyses of several shipments is given herewith: CaO, 48 to 55%; MgO, 29 to 32%; SiO_2, 4 to 11.5%; Al_2O_3, 3 to 6.5%; Fe_2O_3, 4 to 7 per cent.

London-Paris Letter

By Mark R. Lamb

Whatever your business, and whatever your representative is expected to do, there are a few points to which he should attend immediately upon his arrival. This statement is based on the supposition that he wants to appear normal—not eccentric. Of course, if his idea is to be stared and smiled at, these notes are not for him.

For his own comfort and economy he should buy his supply of underwear, socks, shirts, ties, and collars in America before sailing. What he will find here is of miserable quality and enormous price. His hats, top coat and suits should be made in London. The quality of workmanship will be bad, as tailors and nearly all wool have been requisitioned for the army. The cuts, however clumsy, will be English, and therefore normal in London and Paris, as in the good old times. This is an important point when visiting European customers.

Provide your representative plentifully with sugar, or his temper will be bad from breakfast to bedtime. This morning a young Scotchman who was my neighbor at breakfast had found his sugar spilled through his grip. He managed to gather enough together to sweeten his porridge, but his tea lacked sugar, and he was angry. My *vis-à-vis* at lunch drew forth her jewel box and gazed at its contents longingly, finally choosing one small lump of sugar and several tiny scraps. Three officers haggled over a small soap box of coarse brown sugar possessed by one of them. Undoubtedly, this shortage of sugar has undermined the morale of the English nation.

A passenger is permitted to bring in but 1 lb. of sugar, yet most trunks are saturated with packages, and customs officers are not particularly keen on wasting time looking for sugar. When your representative comes, provide him with large quantities of sugar and candy, the first for his customers and the second for their wives. So long as his stock lasts he will be extremely popular and can get you much business.

The very best raincoats are none too good in quality, as the rubber and wool have been adulterated owing to the shortage of both. The price is $30 and over, and in both England and France this garment is a necessity, because the sun rarely shines here. Cigarettes are as popular here as in the United States, and smoking them is not objected to, but American Army men who chew tobacco certainly create a sensation—particularly the officers. In the bars, hotels, and clubs in America the cuspidor is ubiquitous, and personally conducted spitting is entirely unobjectionable. In England it simply is not done! Nowhere is a spittoon in evidence. You may object that it is necessary, or that it is indecent at times not to spit. I cannot help it. It simply isn't done! Colds? Of course! Half of England has a cough and a cold constantly; but that fact does not matter—it simply isn't done!

There are six or a dozen words and expressions in American vocabularies which have entirely different meanings in England. A friend was nearly thrown out of the club for using one of them. Your representative should get the assistance of a gentleman to explain these terms, as it is not possible to cover the points acceptably on paper.

When you start him off, remember that England is a manufacturing country and that Englishmen are patriotic. They are actually paying more now for longer deliveries and inferior goods of home production than would be necessary if purchases were made in America. Some of them are "fed up" with the prices and deliveries which they have been forced to accept lately in America. Cotton goods, heavy machinery, rails, and wire goods are due for a chilling surprise, in spite of the glowing expectations of the New York newspapers and the *Iron Age*. One of the largest American manufacturers of heavy machinery is removing his head office from London to Paris after 15 years. He expects little more business in his line to be placed in the United States by Englishmen.

In France the government policy is to prohibit importation of everything, even including equipment actually required to start industries. Industrials are ready to buy, and few fear competition, but the few are influential momentarily. France is expecting much help from the indemnity to be demanded from Germany, and we all hope she gets it; but deserving and getting are quite distinct. It is easily possible to feel so much self-pity, and to expect so much help, that self-help will be delayed over-long. It is also quite possible that after Germany is told to pay, she will find it difficult, and, without a stable government, impossible.

Everyone who has seen the devastated regions is in favor of their being restored at Germany's expense, and this will be done undoubtedly if it is possible, but France will not wait. I predict a great change in sentiment during the next six months. Opinion among representatives of American houses as to trade conditions varies with the success that each achieves. Some are fortunate in having good stocks ready for immediate delivery, and, when purchases are made through the comptoirs, all difficulties of importation fade away. Greater difficulty is experienced, however, in delivery on direct sales.

No safe generalization is possible, and the only way to ascertain whether business is obtainable is to come over and try.

Lincoln Said: "When an occasion is piled high with difficulty, we must rise to the occasion." There are war tasks to be concluded, readjustments to be effected, individual and national prosperity to be achieved. Buy W. S. S.

Estimating Screen Efficiency

By W. O. BORCHERDT*

Of late years there has been an increased realization of the importance of efficiency records of the work of the various units in an ore-dressing plant. The paper following discusses screen efficiency in detail, points out the fallacy of treating the subject only from the theoretical or academic standpoint, and draws attention to important alternative methods of estimation that deserve consideration.

WRITERS on ore dressing commonly refer to "screen efficiency," and occasionally this term is defined, as in the article by Prof. Robert S. Lewis,[1] wherein the efficiency of a screen is given as the weight of undersize passing through, divided by the total weight of undersize in the feed to the screen; and in the article by Harold Rabling,[2] wherein screen efficiency is defined as the tonnage of undersize divided by the tonnage of fine material in the feed sample.

Both writers give methods for determining the efficiency of a screen when screen analyses are given of the feed, undersize, and oversize products of the screen. Mr. Rabling, in addition, calls attention to the self-evident fact (which is, however, often overlooked) that the efficiency can be correctly derived only when the sizing tests of feed, oversize, and undersize samples of the mill screen are made on a hand screen clothed with the identical screening medium used on a mill screen. This should be done, regardless of whether or not a further screen analysis of each sample is carried out on ordinary testing screens, and if the screening medium on a mill screen has been in use any length of time, so that the openings have enlarged by wear, the efficiency test should properly be made upon a section of the screening medium cut from the mill screen. This procedure prevents the reporting of an absurdity, as Professor Lewis has done, where the cumulative analysis of the mill screen undersize shows 13.9% of plus 30-mesh material, whereas the mesh of the mill screen is stated to have been 30! If it is desired to know how much the holes in the mill screen have enlarged, that is a different question, one which has no connection with screen efficiency, and to be determined by preparing two hand screens, one clothed with a piece of the screening medium which has not been worn and another with a piece of the screening medium cut from the mill screen. A sample of the oversize of the mill screen should then be screened on the unworn cloth, until no more undersize passes through, the material remaining on the screen then being weighed and screened upon the worn screen to determine the percentage which will pass because of enlargement due to wear. Usually, of course, sufficient indication of wear can be obtained by an ordinary laboratory screen test of the undersize of the mill screen.

Although the definition and methods noted above seem to be commonly accepted, I am of the opinion that it is not possible to derive a figure which will denote the efficiency of a screen if the term "efficiency" is used in accordance with its strict definition—as the ratio of output to input. It seems to me that, strictly, the figure derived as above should be called the coefficient of effectiveness of the screen, and that it might be still better to indicate whether this coefficient of effectiveness is based upon the consideration of the undersize or of the oversize of the machine.

My objection to speaking of the efficiency of a screen is based upon the belief that an efficiency figure should be absolute and not relative. When one speaks of the efficiency of an electrical generator, he means thereby the ratio of electrical output to mechanical input expressed in electrical units, which is the same everywhere so long as the stated conditions of the test are realized. The same applies to the thermo-dynamic efficiency of a steam engine, or the mechanical efficiency of a system of gears. In all these cases it is possible to insure the same kind, quality, and amount of input to the machine, or to a similar machine, no matter where the test is made. In the case of a screen, however, there is no way of insuring that the same machine will be fed with the same class of feed at different times, or that two screens of the same or different kinds, situated at different places, can be supplied with the same quality of feed.

Everyone who makes screen analyses must have noticed the peculiar variation in the percentage of samples at any given size. Considering a number of samples of crushed ore, all of them through the same ruling size, no two will give the same cumulative percentage curve. Sometimes the curves will be convex, sometimes concave, frequently reverse, and sometimes compound reverse, and only rarely will they approximate a straight line showing quantities nearly proportional to screen openings. This "bunching" or "crowding" of certain sizes in the pulp which shows so plainly in many screen analyses is, of course, the result of the action of many variables, but in practice it is so marked as to make a fair comparison impossible as between two screens working in different ores.

In Fig. 2, as an illustration, I have platted three hypothetical cumulative screen analyses. In all three the material is through the ruling size of 8 mesh, and in each case 70% of the sample remains on 28 mesh. Curve *D* is a straight line; curve *E* is convex, showing a disproportionate amount of the coarser sizes, and with its fines extremely fine. Curve *F* is concave, and contains nothing finer than 150 mesh.

If a given mill screen clothed with 28-mesh cloth was successively tested with ore represented by each of these samples, the rate of feed and other conditions being maintained constant, the so-called screen efficiency would not be uniform in the three cases. The ore represented by curve *E* would be the easiest to screen, and would show the highest efficiency, because it contains little material close to 28 mesh in size, and the real fine material would, of course, slip through with ease. The ore represented by curve *D* would give intermediate results; that represented by curve *F* would show the lowest efficiency, because its 30% of undersize is all between 28 and 150 mesh, and there is 10% of minus-28 plus-35 mesh, which is naturally the hardest material to get through the 28-mesh screen.

It seems to me that this illustration shows clearly

*Austinville, Virginia.

[1] *Met and Chem. Eng.*, Dec. 15, 1916.

[2] *Eng. and Min. Journ.*, July 14, 1917.

the fallacy of the term "screen efficiency," unless the definition is qualified by requiring an identical feed in each case, which would represent a condition impossible of attainment in practice.

There is another way of deriving a figure for so-called screen efficiency, which, however, does not give true efficiency either, but furnishes a more convenient and in some respects a fairer method of comparing the performances of a screen under different conditions of load, quality of feed remaining the same, or at fixed tonnage with variable quality of feed.

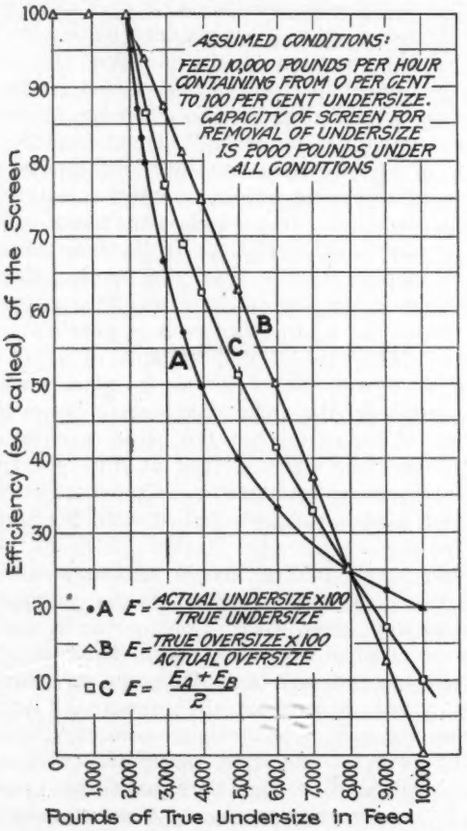

ASSUMED CONDITIONS:
FEED 10,000 POUNDS PER HOUR CONTAINING FROM 0 PER CENT TO 100 PER CENT UNDERSIZE.
CAPACITY OF SCREEN FOR REMOVAL OF UNDERSIZE IS 2000 POUNDS UNDER ALL CONDITIONS
Efficiency (so called) of the Screen
A
B
C
•A E = ACTUAL UNDERSIZE x 100 / TRUE UNDERSIZE
△B E = TRUE OVERSIZE x 100 / ACTUAL OVERSIZE
□C E = (EA + EB) / 2
Pounds of True Undersize in Feed

FIG. 1. DIAGRAM OF SCREEN EFFICIENCY

The method given by Professor Lewis and Mr. Rabling looks upon the performance of the screen from the point of view of the undersize in the feed, and may be formulated as efficiency per cent:

$$E\% = \frac{Actual\ undersize \times 100}{True\ undersize}$$

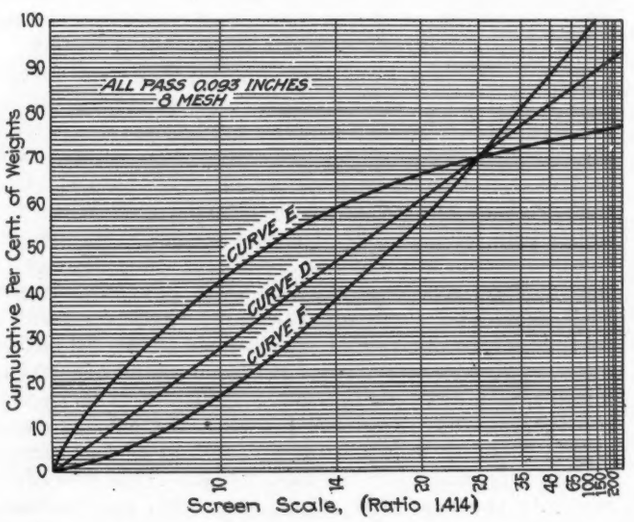
The alternative method mentioned in the preceding paragraph regards the performance of the screen from the standpoint of oversize and efficiency per cent:

$$E\% = \frac{True\ oversize \times 100}{Actual\ oversize}$$

In Fig. 1 I have assumed that a given screen is capable, under all conditions, of taking 2000 lb. of undersize per hour out of the feed. This condition would, of course, not be realized in practice, because, as pointed out in connection with Fig. 2, the class of the feed has a considerable influence upon the performance of the screen, even when the total feed and percentage of undersize remain the same. It is assumed, also, that the feed consists of 10,000 lb. per hour, varying from 0% to 100%, and the efficiency, so-called, is platted by both methods against the pounds of true undersize in the feed. Curve *A* shows the efficiency according to the usual method based upon the undersize, where in each case the numerator of the efficiency fraction is constant at 2000 times 100. Curve *B* shows the efficiency, so-called, based upon the oversize, the efficiency fraction having a constant denominator of 8000.

Both curves show 100% efficiency with feeds containing 2000 lb., or less, of undersize. The *A* curve drops away rapidly in its upper portion, and much more slowly in its lower portion, whereas curve *B* decreases at a constant rate. Considering curve *A*, if the feed contains 3000 lb. of undersize, of which the screen is capable of taking out only 2000 lb., the efficiency drops 33⅓%, though if in its lower range the feed contains 10,000 lb. instead of 9000 lb. of undersize, the efficiency drops only 2½ per cent.

If the function of the screen is to get out the largest possible quantity of undersize, and, for example, return the oversize for regrinding, then it is, no doubt, correct to view the performance from the standpoint of curve *A*. If, on the other hand, the screen is employed to produce an oversize material for treatment on a jig or table, for example, it would seem fair to view its performance from the standpoint of the quality of the oversize which it produces, as in curve *B*, and in this case throwing over 8000 lb. of oversize instead of 7000, though, of course, not desirable, would penalize the efficiency only 12½%, which would probably be a closer measure of the value of the performance than that given by curve *A*. In the lower part of its range, however, curve *B* does not give due credit to the screen for taking out some undersize, and as there results, accordingly, the condition that the upper part of curve *B* and the lower part of curve *A* seem to measure performance within their respective ranges most fairly, I



Screen Scale Ratio, 1.414

Openings, Inches	Openings, Millimeters	Diameter Wire, Inches	Mesh	Cumulative Per Cent. Samples D	E	F
0.093	2.362	0.032	+ 8	0.0	0.0	0.0
0.065	1.651	0.035	+ 10	27.5	42.5	17.1
0.046	1.168	0.025	+ 14	47.6	58.2	37.5
0.0328	0.833	0.0172	+ 20	60.0	66.0	56.0
0.0232	0.589	0.0125	+ 28	70.0	70.0	70.0
0.0164	0.417	0.0122	+ 35	76.6	72.2	80.0
0.0116	0.295	0.0092	+ 48	81.3	73.3	87.5
0.0082	0.208	0.0072	+ 65	85.0	74.2	93.2
0.0058	0.147	0.0042	+100	87.2	75.0	97.2
0.0041	0.104	0.0026	+150	89.0	75.4	100.0
0.0029	0.074	0.0021	+200	90.0	76.0	.....
.....	.....	.....	.....	100.0	100.0	.....

FIG. 2. CUMULATIVE DIRECT DIAGRAM OF SCREEN ANALYSIS ON SAMPLE OF FEED TO 28-MESH SCREEN, USING TYLER STANDARD SCREEN SCALE

have drawn another, curve *C*, which represents the mean values of curves *A* and *B* in each case, and represents the performance of the screen viewed from the standpoint of both the oversize and undersize produced by the machine.

As before stated, I do not believe that any of these figures can truly be called efficiency figures, and I do not believe that it is possible to make comparisons of two screens operating on different feeds or on the same feed at different rates. The legitimate field for the determination of screen efficiency is limited to the comparison of a given machine at different times with the same rate and quality of feed; and, if this is granted, then the oversize method platted as curve *B* in Fig. 1 becomes the most convenient method of securing a comparative figure, because it requires the taking of but one sample, the oversize of the mill screen. This sample is screened upon a hand screen clothed with the same screening medium as that on the mill screen, and the coefficient of effectiveness may be stated as follows:

$$Ce = \frac{Oversize\ of\ hand\ screen}{Sample\ weight}$$

In practice the quality of pulp fed to a screen generally resembles that of the left half of Fig. 1 with less than 50% undersize, and, therefore, comparisons based on curve *B* will not be affected by the consideration respecting the lower part of curve *B*.

Some screen manufacturers follow the practice of screen-testing the oversize of their mill screen on the next finer sized cloth than that used on the mill screen. There seems no reasonable justification for this.

Disinfecting Small Quantities of Water

Occasionally the travels of an engineer lead him into outlying districts where sanitary conditions are far from perfect and available supplies of drinking water may be pulluted. The following article from *Engineering and Contracting* offers a method of avoiding contamination and should be of interest.

As the result of a study by Dr. Henry A. Dakin, the English chemist, a new product has been found for disinfecting such small quantities of water as are used by the soldier or the engineer in his water bottle. The experiment conducted by Dr. Dakin indicates that the substance will sterilize an ordinary heavily contaminated water (e. g., containing coli, typhoid or cholera organisms) in about 30 min. It imparts a perceptible but not disagreeable taste to the water. The disinfectant is put up in the form of tablets, which if properly made are stated to be stable enough for all practical purposes.

To ascertain the effectiveness of the tablets on a heavily polluted water, a series of tests was made recently in the water laboratory of the Bureau of Engineering of the Florida State Board of Health. The water used was obtained from a stream heavily polluted with surface wash and receiving considerable sewage. In the test one tablet was applied to each 250 c.c. sample. The raw water contained 5000 bacteria per c.c. After the tablet had been in the water 15 min. the count was 500 bacteria per c.c.; after 20 min., 160 and after 30 min., 50 c.c., which is a 99% reduction in 30 minutes.

A second series of samples from the same source was tested, a tablet and four drops of lemon juice being added to each 250 c.c. of water. In this test the bacteria count was reduced to 120 in 15 min., to 90 in 20 min., and 50 in 30 min. These results, states the official bulletin of the State Board of Health from which this note is taken, indicate mainly that the tablets effectively disinfect small quantities of heavily polluted water within 20 to 30 min. with a complete disappearance of gas-forming organisms and colon forms as well as a great diminution of bacteria. The addition of lemon juice apparently hastens the effectiveness to a degree. The chemical name for this disinfecting agent is Parasulphondichloraminobenzoic acid. Its common name is halazone. Halazone tablets are prepared in a convenient form by several large laboratories—small vials of 100 to 1000 being on the market.

Auxiliary Hoist for Traveling Cranes

The average traveling crane employed at a mine shop, power plant, or smeltery during a day's work usually handles a greater number of light loads than heavy ones, and inasmuch as cranes for lifting heavy loads are slow-moving, their use results in a serious loss of time if they also handle the light loads. Thus a 20-ton crane, direct-current, with a hoisting speed of 12 ft. per min. per load, will handle a 3-ton load at but slightly greater speed. But by means of an auxiliary hoist a light load may be handled at a speed from two to ten times that of the main crane. The attachment of such an auxiliary also effects an important power saving. Often the hook and block of the main crane together weigh more than some loads frequently handled. The auxiliary hook and block being much lighter, it is evident that the power saving in a year's time becomes worth while. The saving of labor is another important item, especially when a gang of men must wait for a small piece to be slowly moved by a large crane. This is a vexing circumstance with which many foremen are familiar, and the use of the auxiliary eliminates this labor loss.

A simple and practicable auxiliary hoist that may be attached to any standard overhead electric traveling crane has recently been developed by N. B. Payne & Co., 25 Church St., New York. This hoist is quickly and easily attached, it does not take up any more room overhead, does not require an extra trolley, does not shorten the travel of the trolley on the bridge, nor does it interfere with the accessibility of the main hoist. Ordinarily from one- to five-ton standard auxiliary hoists are supplied by the makers to meet the usual requirements, but larger special sizes are furnished if necessary.

By means of the application of this auxiliary attachment, any standard single-hoist electric traveling crane may be equipped with two lines for drop-bucket service. The control may be arranged from cage, floor, or pulpit, to suit the crane to which it is applied.

Iron-Ore Imports in 1918 decreased and the total was only 787,486 gross tons, as compared with 971,663 tons in 1917 and 1,326,864 tons in 1916, according to *Iron Age*. The source of these imports was as follows: Spain, 38,385 tons; Canada, 115,354; Cuba, 632,442, and other countries, 1281 tons. During 1918 no ore came from Sweden, which even early in the war contributed a liberal supply. Recently little Chilean ore was imported, and that from other countries declined to only about one-eighth of what it was in 1916 or even 1913. As contrasted with the pre-war figures of 1913 the decline is marked in every detail. Exports of iron ore have been fairly constant in the last three years, having been 1,256,431 tons in 1918, as contrasted with 1,132,313 tons and 1,183,952 tons in 1917 and 1916 respectively. In 1913 the exports were 1,042,151 tons.

Air-Volume Regulation in Smelting and Refining Furnaces

By C. H. SMOOT*

IT HAS been customary almost from the inception of the metallurgic arts to operate blast furnaces for steel and iron with a constant volume of air, which is obtained in practice by assigning one or more blowing engines to each furnace. Desirable results are obtained from this condition of constant volume, which gives a uniform rate of combustion in the furnace and permits charging to be conducted in a uniform way. Variations from a normal condition are reduced by the delivery of a constant volume of air to the furnace as the principal basic condition.

In the smelting of lead and copper ores and the operation of copper converters, many metallurgists have considered a constant volume of air to each furnace to be highly desirable, and for the same reason that it is of assistance in the furnace operation when smelting iron. The rate of charging on these furnaces may be uniformly maintained, and changes of charge need vary only with difference in the quality of materials charged to the furnace.

When furnaces are run in parallel, and supplied by a common system of blowing engines, the air volume delivered to each furnace is not constant. The furnace whose charge is tight receives less air from the common supply than the neighboring furnace whose charge is loose. Such a condition is exactly the reverse of that desirable for uniformity of furnace performance. Generally the furnace whose charge becomes tight should have an increased volume of air for a short time, rather than a decrease in quantity. Conversely, the furnace whose charge is loose should not receive an excess of air.

These conditions have long been recognized in the smelting of copper and other metals, but few smelting installations have been made in which each furnace receives air from a separate blowing engine. Such an installation would greatly increase the expense of the plant, and it is doubtful as to whether the increased cost would be warranted by the improvement obtained. Nevertheless, it is clearly recognized that a constant volume to each furnace, if obtainable, is a highly desirable feature in any smelting operation.

The Rateau-Battu-Smoot Engineering Corporation has been furnishing turbo blowers for some time for use in smelting copper, and similar work, and has developed constant-volume regulators which meet the conditions of the average smelting plant. The system involves a central blower plant, which supplies air to a number of smelting furnaces. Usually a single header for the air blast is employed, from which branch connections are led to each of the furnaces.

A constant-volume regulator is installed in each of these branch sections, which insures that each individual furnace receives the constant volume for which it is adjusted. The lack of this condition is one of the principal causes of frozen furnaces and irregular operation, and also of uneconomical operation.

When the air is deficient, owing to the furnace being tight, the rate of smelting is reduced and the output becomes less. If, on the other hand, the air delivery is in excess and the amount of coke charged is not increased to compensate for the excess oxygen, metal is lost in the slag because of the excess of oxygen and the absence of a sufficient reducing atmosphere in the smelting zone. Hand regulation of the air volume from a constant-pressure source is, obviously, in constant alternation from one condition to the other, because the resistance of the furnace is subject to constant change and therefore the volume of air varies continually above and below the proper amount.

When furnaces are operated without any means of checking the air volume, uneconomical results are inevitable, both coke and metal being lost and the furnace capacity reduced. If, however, the volume is regulated and kept uniform, the furnace may be operated continuously at maximum capacity and efficiency, with a minimum of fuel and maximum of metal recovered. In extreme cases a furnace may freeze as a direct result of incorrect regulation caused by a charge which is tight and which prevents a flow of sufficient air to maintain a smelting temperature.

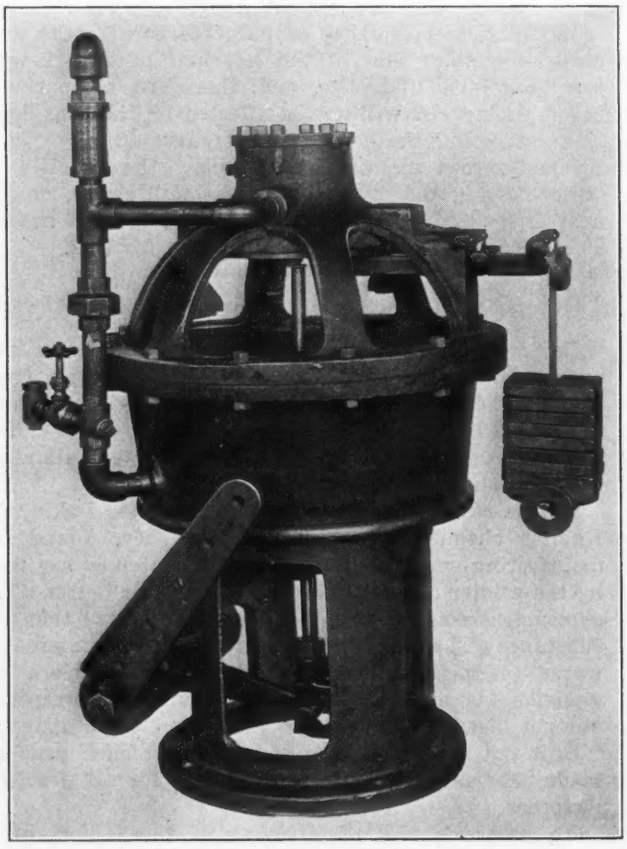


FIG. 1. REGULATING MOTOR FOR VOLUME CONTROL

In the operation of large furnaces it is desirable to carry the regulation even further than to control the volume delivered to each furnace as a whole, by subdividing the control, using several regulators, each of

*Engineer, Rateau-Battu-Smoot Engineering Corporation, 140 Cedar St., N. Y.

which delivers, to a given section of tuyeres, a constant volume.

For example, two-volume regulators may be used, one controlling each side of the furnace; or, on large furnaces, four regulators could be advantageously employed, subdividing each side of the furnace into two sections, each controlled by an individual constant-volume regulator. This subdivision of control insures a uniform delivery of air to different parts of the furnace and prevents the formation of a hole in one side of the furnace, robbing air from the other side.

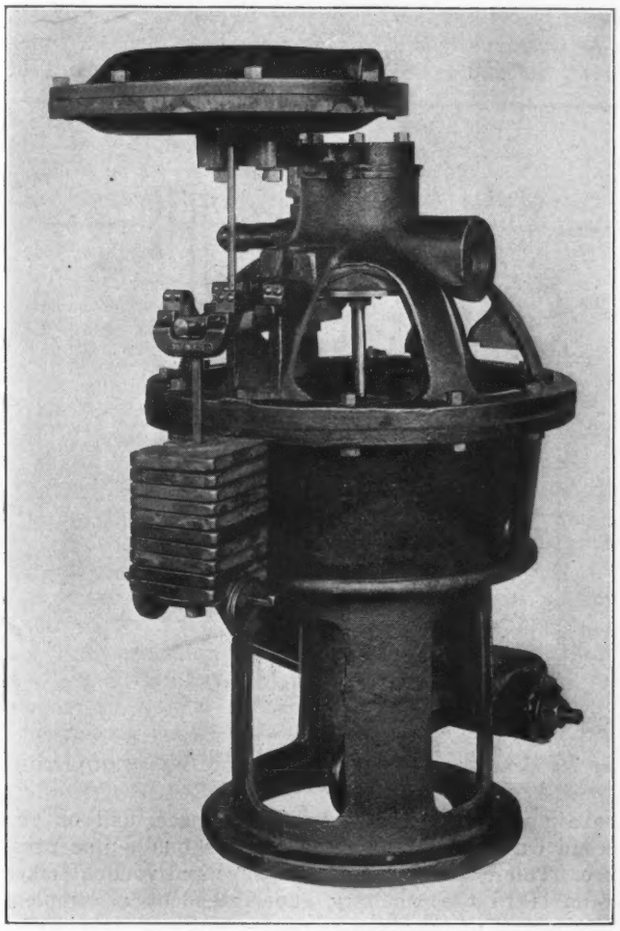


FIG. 2. REGULATOR READY FOR INSTALLATION

It has often been noted, when the furnace is charged with a mixture of bed ore and roaster fines, that it is necessary to distribute evenly over the entire charge the fine and bed ore in order to present as nearly as possible a uniform resistance to the path of air. The reason for this is to be found directly in lack of air-distribution control; for, when a section of the charge receives an excess of roaster fines, the air paths are closed; and, with uniform pressure, the quantity of air passing through this section of the charge is reduced, and an excess passes through some other section in which the fines are not present. A subdivided regulation of air volume serves largely to correct this condition and maintain uniform rates of smelting throughout all parts of the charge.

A large furnace, from this point of view, is in somewhat similar case to several different furnaces, all connected to a common air header, because within a single large furnace there may be sections of the charge through which the air passes more freely than is the case in others.

In furnace operation, the lack of a distributing air-volume regulation requires an excess of coke sufficient to give good results in any portion of the charge which may become loose and thereby receive an excess of air.

No advantage is obvious in regulating a total volume of air to the furnace plant for constant volume, because it is the individual supply of air to each furnace which should be maintained at constant volume. Therefore a regulator has been developed which controls the amount of air flowing from the blast main to each furnace. The regulator comprises a butterfly valve in the blast line, under control of a volume motor. The volume motor is operated from the blast-air volume, and serves to open and close the damper valve in the blast line in such a way as to pass to each furnace or section of furnace a constant volume of air.

Installed in each branch blast line, feeding air to the tuyeres, is an element called a multiplicator, which is inserted through a hand-hole in the blast main, and from which lead two pipes which bring a small pressure for purposes of control to the regulating motor. This control pressure is in response to the volume of air passing the pipe, but does not change with the static pressure.

Fig. 1 shows a regulating motor suitable for volume control. The motor is a complete unit, and is connected to the regulating butterfly valve (within blast main or bustle pipe) by means of a link connecting to the arm shown at the lower left-hand part of the cut. Fig. 2 illustrates a regulator ready for installation in metallurgical works.

When adjusted for delivery of a given volume of air to a furnace, these regulators maintain this volume regardless of furnace resistance and changes in pressure, up to the point at which the maximum available pressure is only just sufficient to pass the required volume through the furnace. Several furnaces may be operated from a common bustle pipe and each furnace receive the constant volume for which its regulator is adjusted, regardless of changes of condition in the other furnaces.

Volume and pressure meters are also available which will draw a 24-hour chart of the air volume delivered to the furnace, and record the bustle-pipe pressure. The charts give a complete continuous record of volume and pressure, and indicate clearly the furnace behavior, showing the presence or absence of holes in the charge, and giving ample warning of such trouble as a frozen charge. The meters also assist in keeping the furnace always at full capacity and maximum efficiency.

The regulating motors to control constant air volume operate through damper valves placed in the air line, opening and shutting as necessary to pass the volume for which they are adjusted.

The equipment is easily installed. The only labor required to equip a furnace with this regulation is usually in connection with the bustle pipe, or the air line to the bustle pipe, permitting the insulation of the control damper valve. This can be done even though the bustle pipe is so closely connected that no external piping is available for installing the control valve, by mounting within the air main a small section—usually rectangular—in which a damper valve is placed, controlling the amount of air flowing to the furnace. Fig. 3 is a diagram of valve and regulator, as applied to the connection between one furnace and the main blast heads.

The detailed operation of the volume regulator is as follows:

The damper valve *A* is the regulating means, which, by varying its orifice, passes constant volume to the furnace. *B* is the multiplicator, which gives a pressure difference between the pipes *C* and *D*, in strict proportion to the air volume passing *B*. *E* is the connecting link, which transmits regulating motion from the constant-volume regulating motor to the valve *A*.

The regulating motor comprises the power diaphragm *F*, which is made of leather $\frac{1}{4}$ in. thick and heavily loaded with cast-iron weights. Energy for the motion of this diaphragm and connected parts is obtained from a small flow of air under 2-lb. pressure entering the apparatus at *G*.

The air pressure underneath the diaphragm *F* is caused to vary 500 times as much as the pressure difference from pipes *D* to *C*. This large multiplication gives 150 lb. of effort at diaphragm *F* to operate the damper valve for each $\frac{1}{10}$-in. water-column pressure difference between the control pipes *D* and *C*. The multiplication is obtained in the following manner:

The differential pressure *D* to *C* bears downward on the diaphragm *H*, which has a large area. This pressure is counterbalanced by the adjusting weights *I*, and in part by the pressure under the diaphragm *F*, which is connected through piping to bear upward underneath the multiplying valve *J*. The multiplying valve has $\frac{1}{500}$ part of the area of the multiplying diaphragm *H*. This valve floats slightly off its seat all the time, and a balance is maintained between the upward pressure on the small valve *J*, the counterweight *I* and the velocity pressure on diaphragm *H*. A slight increase in air volume going through the duct displaces the diaphragm *H* downward a small amount, restricting the air flow through the valve *J* and building up a large increase in pressure because of this restriction underneath the diaphragm *F*, which large increase in presture supplies the powerful energy to operate the regulating valve *A*.

The fundamental principle employed in these regulators is briefly described as the multiplication of the departure from normal of regulated condition from 400 to 1000, and applying this multiplied pressure departure on a large diaphragm or piston to furnish the necessary energy to accomplish regulation. By means of this principle these regulators are able to control accurately pressure differences heretofore too small to permit regulation. In a general way the multiplication allows pressures of fractions of an inch (water column) to be regulated with the same accuracy and power as have heretofore been possible in regulating pressures of many pounds per square inch.

In a blast-furnace installation the volume multiplicator has a water gage connected between pipes *D* and *C*, and calibrated with a volume scale which is determined for each installation. The volume regulator is equally applicable for use to control the speed of engine or motor-driven blowers for constant volume of delivery; and composite equipment may be used in which both the engine, or blower, and furnaces are individually controlled.

When operating a lead or copper furnace on a constant volume of air, the condition of the charge is continually indicated by the bustle-pipe pressure, as this pressure denotes the resistance of the charge, the presence or absence of holes, and whether or not the charge is tight or loose, and furnishes a nearly complete record of what is going on in the furnace. The bustle-pipe pressure indicates nothing, however, when the furnace is running without a constant-volume regulator; and, when several furnaces are supplied from a common main or bustle pipe, the pressure at each furnace is maintained regardless of condition of charge and presence or absence of a hole through which the blast may be passing freely. When running on a constant volume, should a hole develop in the charge, the pressure in the bustle pipe will drop, and the volume regulator may be temporarily readjusted for a much larger volume than normal until the condition is corrected.

A two-curve recording meter has been devised, which shows on one curve a 24-hour continuous record of the air volume delivered to the furnace, and on the second curve a similar record of the bustle-pipe pressure. This chart of the air pressure and volume makes available to the smeltery superintendent a complete daily record of the furnace performance, and is useful for checking the details of operation.

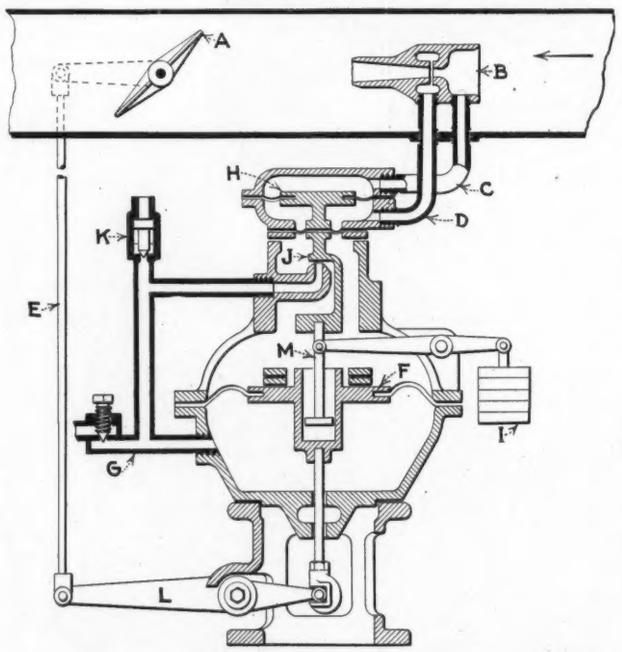


FIG. 3. DIAGRAM OF CONSTANT-VOLUME REGULATOR

A regulator, known as the proportional-volume control, by means of which either gas- or oil-fired furnaces are regulated in such a way that the volume of air is in a fixed and correct proportion to the volume of gas or oil supplied to the furnace, is also available. This is analogous to the gas-engine carburetor, in that it meters the relative proportions of air and fuel. The chemical character of the gases, as well as their temperature, may be accurately controlled; and, furthermore, a maximum economy in consumption of fuel is obtained, because excess or deficiency of air is automatically prevented.

Benjamin Franklin gave this advice to a young man: "Keep an exact account for some time, both of your expenses and your income. If you take the pains at first to mention particulars, it will have this good effect: you will discover how wonderfully small trifling expenses mount up to large sums, and will discern what might have been and may for the future be saved without occasioning any great inconvenience." Put those savings into W. S. S.

Liquid Oxygen Explosives*

The military necessity which compelled Germany to requisition her entire stock of nitric explosives created an emergency which gave liquid oxygen its opportunity, and its development as a mining explosive has occasioned considerable comment.

The explosives now in general use are mixtures or definite compounds containing two essential constituents, a combustible element, carbon, and an ignition element, oxygen. The explosion is the result of the abrupt and violent combination of these two elements. Oxygen is introduced under the form of nitric combination or chlorinated combination, whereas the carbon is in the form of an organic matter. Therefore, in ordinary explosives, the combination of the active elements carries with it a considerable dead weight, constituted by the other elements.

This is not the case with "Oxyliquit," for in the latter the liquefied oxygen is put in contact with carbon in a divided and porous form. Under a system of ignition the combination takes place with explosion, and in principle the procedure is perfect. In the evolution of this process, however, which was first invented by Linde in 1895, many difficulties were encountered.

Liquid oxygen is always produced on the spot where it is to be used, as it is impossible to prevent volatilization for very long, notwithstanding all the precautions. It is prepared by liquefying the air, the mixture so obtained of liquefied nitrogen and oxygen being submitted to a partial distillation, which eliminates the larger part of the nitrogen, more volatile than the oxygen. The resulting bluish liquid contains about 85% of oxygen. A German company exploiting the Linde patents is able to furnish installations giving an hourly output of 23 lb. (10 kg.) of liquefied rectified oxygen.

Transportation of the liquefied oxygen from the place of production to the place of utilization, mine or quarry, required a new container. In the laboratory, glass vessels, so-called "Dewar" bottles, having double walls with a vacuum between, have been used for the keeping of liquefied oxygen. These bottles are not closed—on account of the danger of a closed bottle in handling—but, owing to good insulation, the loss of oxygen by evaporation is small. These glass bottles, easily breakable, are neither convenient for wholesale manufacturing nor for use in the workshop, and are now replaced by containers of metal—especially brass and steel—which give excellent service.

The steel or brass bottles do not hold the vacuum as well as those of glass, and the vacuum must be often renewed. To lessen this inconvenience, Dewar inserts porous charcoal between the walls.

By what is known as the Kowastsch method, the liquid oxygen is poured upon lampblack in the bore hole. A cylindrical cardboard cartridge is made of the same diameter as the hole, the cartridge containing the lampblack or other porous material rich in carbon. It is closed at both ends with cardboard or cork. Two small tubes of thin cardboard pierce the stopper at the outer end. These tubes serve for the pouring of the oxygen; also for the ignition system (fuse or electric). The cartridge being thus made, a metal rod is inserted in each tube to prevent it being crushed, and the cartridge is deposited at the bottom of the hole, which is then packed with a wad of clay. The metal rods are extracted and the liquid oxygen is poured in through the larger tube by means of an elbow funnel. The gaseous air escapes by the shorter tube, and also the overflow of liquid oxygen when the cartridge is saturated completely. The cartridge is now ready for the firing. The explosion is comparable to that of dynamite.

The Marsit method allows of a more regular working. It is therefore more in use than the other. Here the cartridge is saturated before being introduced into the bore hole. To do this the cartridges are immersed in a special vessel of cylindrical shape with double walls filled with liquid oxygen. The cartridges are first exposed for a few minutes to the vapors above the liquid to cool them off, then completely immersed for half an hour. The saturation is therefore complete. When the cartridge is saturated, it is taken out and the ignition system attached as quickly as possible. It is then placed in the bore hole, tamped and exploded.

The manipulation in this method is far simpler than in the first mentioned. The only inconvenience is the unavoidable delay between the taking out of the cartridge and the placing in the bore hole. During the lapse of these few minutes a certain part of the oxygen of the cartridge evaporates. To lessen this loss, and to keep in the lampblack a sufficient excess of oxygen, the walls of the cartridge, which are made watertight, are of corrugated cardboard. No detonator is needed to explode these cartridges, and this is one of the advantages of the new method. All that is necessary is a small primer ignited by a fuse or by electricity.

The principal company manufacturing "Oxyliquit," the Sprengluft Gesellschaft, of Berlin, claims to have delivered each year an equivalent of 10,000 tons of nitric explosives. Even allowing for probable exaggeration, this figure shows how widely this product is used in Germany. Its greatest advantage over other explosives is that it almost entirely eliminates the danger of accidents. The cartridge itself is explosive for about 10 min. only, between the time of its saturation and the time of its ignition. During this time the danger is not any greater than with any other explosives. The result is that in case of a miss it is only necessary to wait half an hour for the cartridge to become entirely harmless, and then one can uncover the bore hole without danger. Moreover, all dangers inherent to transportation and storage of the explosive are entirely eliminated.

The method, however, has its inconveniences, the principal objection being that it is impossible to store liquid oxygen, necessitating the establishment of a liquefaction and rectifying plant at the place where it is used. Also, there is need of experienced hands for a quick charging of the hore holes.

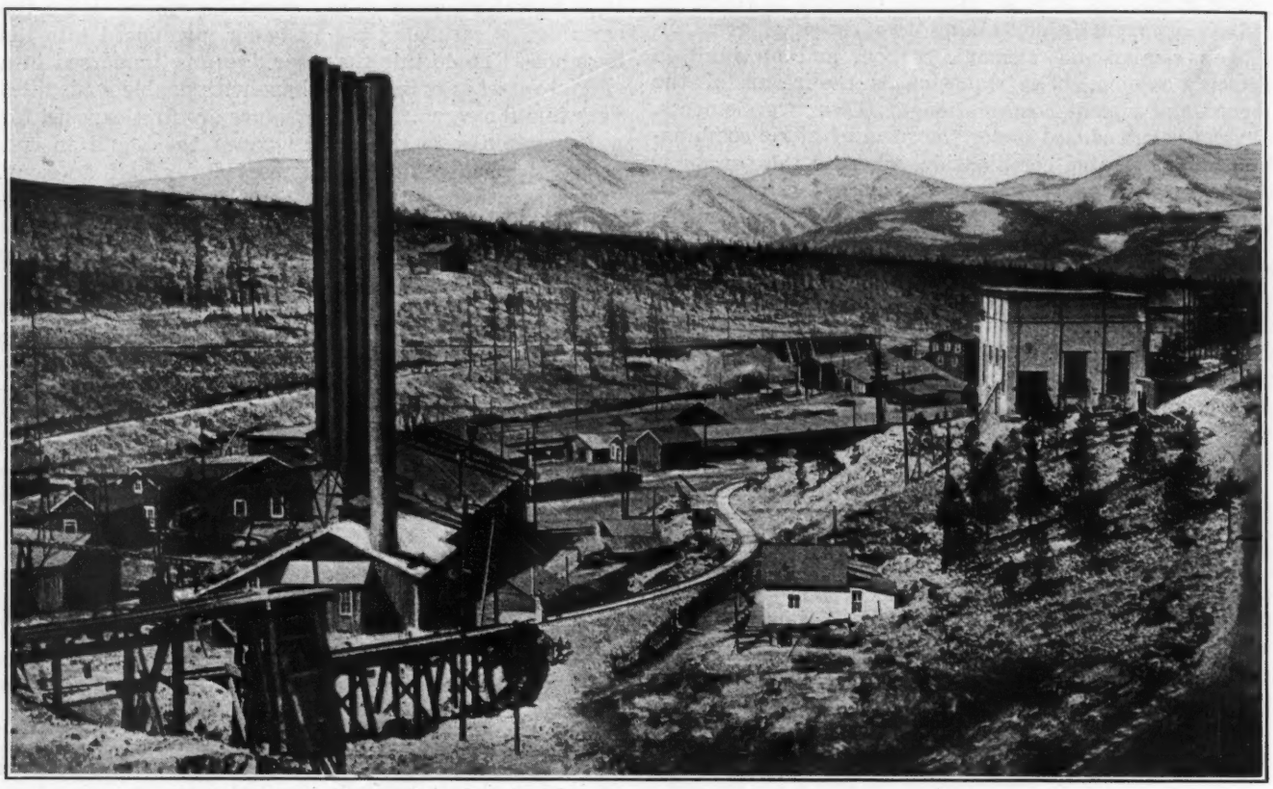
Theoretically the new explosive many claim superiority over others. In practice, however, it gives an explosion hardly equivalent to the most powerful explosives known, common dynamite and gelatin-dynamite.

*Abstract of an article appearing in the January issue of *Compressed Air Magazine.*

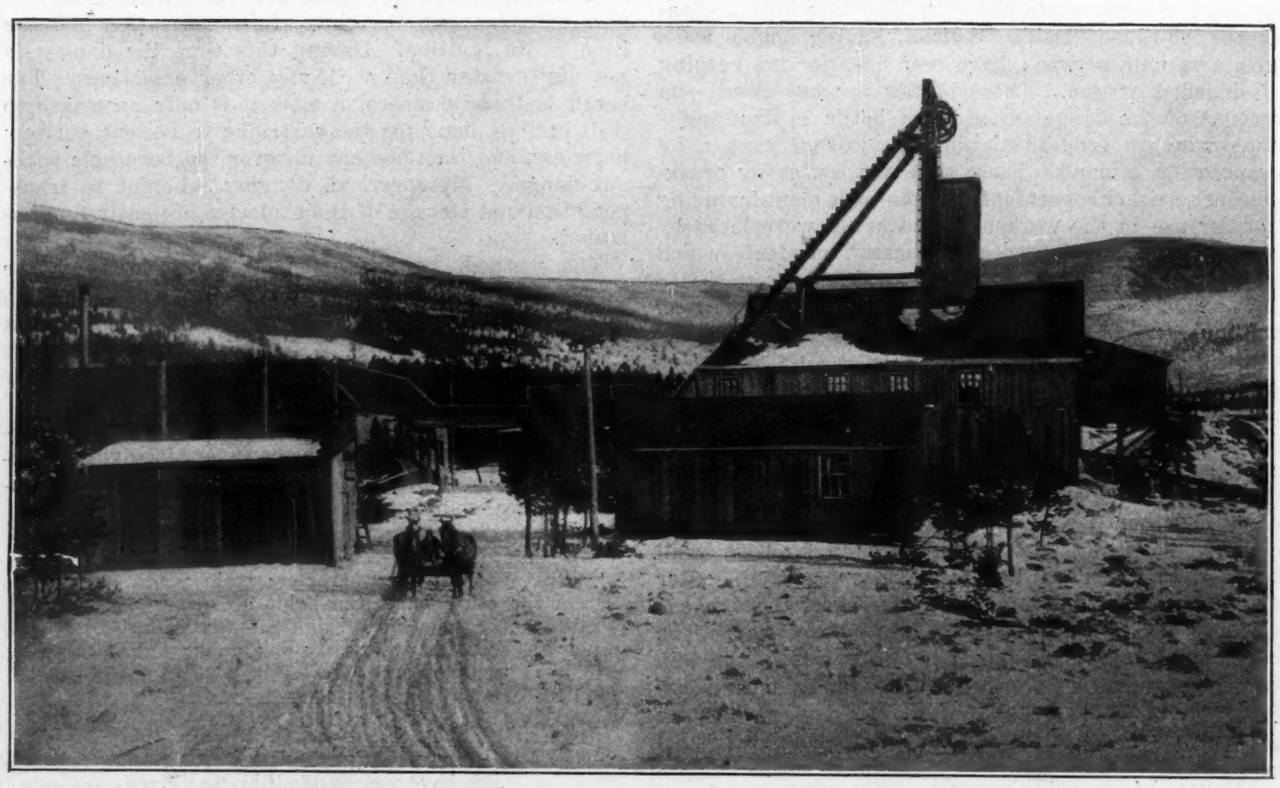
"Extravagance Rots Character; train youth away from it. On the other hand, the habit of saving money, while it stiffens the will, also brightens the energies. If you would be sure that you are beginning right, begin to save."—(Theodore Roosevelt.) Buy W. S. S.

Sing a song of Saving Stamps,
The cost of living's high,
But have you counted all the things
These Saving Stamps will buy?

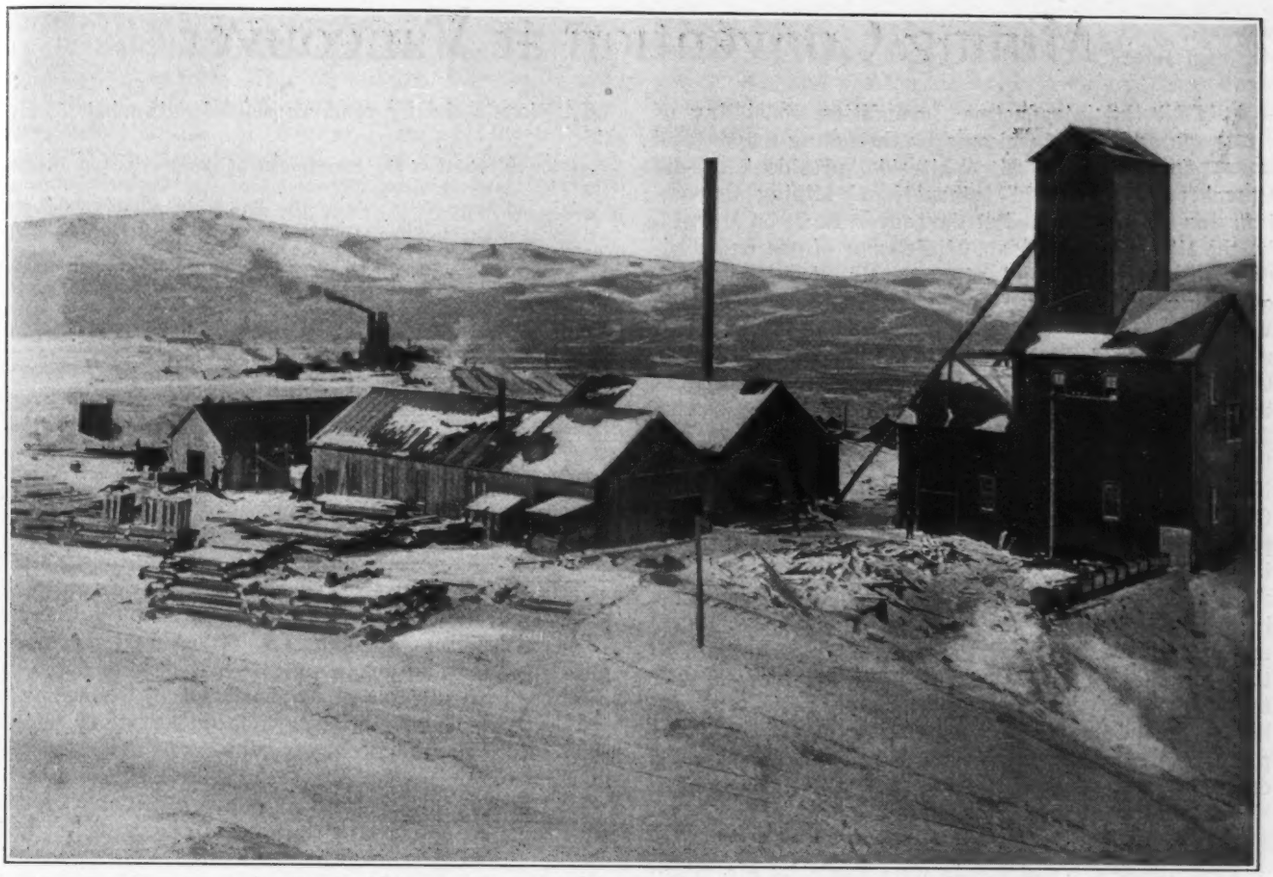
Mines in the Leadville, Colo., District



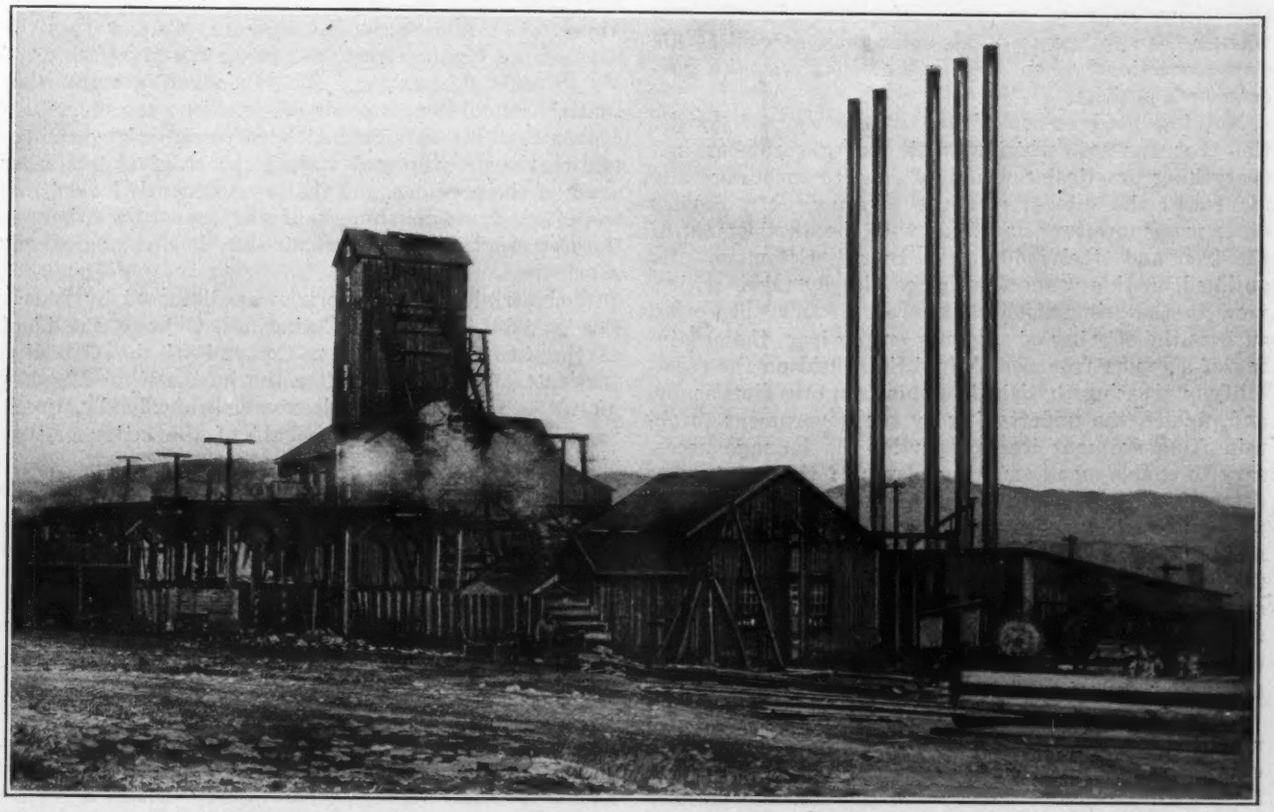
SURFACE PLANT OF THE YAK MINING, MILLING, AND TUNNEL COMPANY



HARVARD SHAFT IN BIG EVANS GULCH, LEADVILLE, COLORADO



MIKADO SHAFT AT LEADVILLE, OPERATED BY THE IRON SILVER MINING COMPANY



WOLFTONE SHAFT OF WESTERN MINING CO. AT LEADVILLE, COLORADO

Mining Convention at Vancouver

AFTER the introductory formalities, consisting of an address of welcome by the acting mayor, and another by A. M. Whiteside, president of the Chamber of Mines, the International Mining Convention was formally opened at Vancouver, B. C., on Mar. 17, by the Hon. William Sloan, Minister of Mines, in an address of more than usual interest. Mr. Sloan spoke to a gathering which packed one of the large halls of the Vancouver Hotel. Reference was made to the excellent results achieved by the mining industry in British Columbia in 1918, statistics showing an increase in the monetary value of its production, as compared with 1917, whereas many U. S. Western mining states, notably Utah, Nevada, Idaho, Colorado, California, and New Mexico, had recorded a decline. The value of British Columbia's coal output had grown materially. The production of the metalliferous mines was much greater in quantity in 1918 than in the preceding year, although showing a comparatively small augmentation in value, because of the lower prices of copper, lead, and other metals. In this connection Mr. Sloan paid tribute to the work done both by coal and metal miners during the war in coöperating with the management of collieries, and of metalliferous miners in the effort to promote production to meet the extraordinary demands created by the war.

The Iron and Steel Industry in British Columbia

Two significant statements were made by Mr. Sloan on questions of administrative policy. One was that it was realized by the government that, if the capital necessary to develop the minerals of the province is to be secured, good returns, as far as possible in mining operations, must be assured. He knew that he was voicing the sentiments of his colleagues, as well as his own convictions, when stating that such was the government's position.

Nothing need be looked for in the way of legislation that was not consistent with good government, and everything practicable would be done to encourage and safeguard the interests of the investor. Mr. Sloan's other pronouncement had to do with the development of the iron and steel industry in British Columbia. He outlined, in this connection, steps already taken with a view to the stimulation of interest in this enterprise, such as the offering of a bounty on pig iron, the obtaining of a report from Dr. Alfred Stansfield on the feasibility of treating British Columbia iron ores electrically, and, finally, the undertaking by the government to obtain from dormant iron properties the tonnage necessary to enable small smelting plants of the province to determine experimentally, in a practical manner, the possibility of manufacturing pig therefrom. He then asserted that it had been established that there was sufficient magnetite ore in the province to assure a small smelting plant a continuous supply. By this was meant that there was enough of the class of ore indicated, either in sight or proved, to warrant the establishment of such an industry on a modest scale. This, however, was not to be interpreted as an admission that the magnetite reserves of the Northwest are of no greater extent, because, personally speaking, he was convinced that, with development, they will be shown to be sufficient to feed the largest industrial plant.

Mr. Sloan's closing remarks roused enthusiasm. He said:

> Again, on behalf of the government of the province of British Columbia, I extend a cordial welcome to our visitors, and more especially to those from across the line. Mr. Chairman, there is no line. We on this continent have lived in peace and harmony for over 100 years. In the great conflict which has just been so triumphantly concluded, the sons of the United States and of Canada, your sons and our sons, have mingled their blood on the fields of Europe in the fight for common freedom. We have been cousins in the past, but now and for the future we are brothers.

Development of Magnetite Deposits

M. J. Carrigan, of Seattle, in speaking to the delegates assembled at the concluding entertainment of the convention, recalled Mr. Sloan's statement regarding the iron-ore reserves of the province and dwelt on its significance. Mr. Carrigan thought it possible that the importance of the fact that a man in responsible official position had felt justified in going as far in respect to the ore available was not appreciated. It might result in the initiation of an industry. If so, the importance of the matter could not be overestimated, because shipbuilding on the Pacific Coast depended on development such as will permit the securing of the steel needed from local manufacturing centers. That industry, which now was responsible for the circulation of millions of dollars in Vancouver, Victoria, Seattle, Oakland, San Francisco, and other cities of the West, was destined to decline and pass away if steel could not be secured without the burden of transportation from the industrial plants of the East. The shipbuilding industry was born of an artificial condition, and could be maintained only if the West were able to obtain its supplies at rates at least approximating those available to shipbuilders elsewhere. For this reason the iron-ore deposits were the hope of the Pacific Coast, and hence the significance of Mr. Sloan's declaration. Mr. Carrigan averred that British Columbia possessed sufficient iron ore for fifteen years; that his opinion had been confirmed by competent engineers who had visited the chief iron-bearing areas of the province, and that he confidently looked forward to the establishment of the industry, either on the Canadian or the American side, in a comparatively short time.

"Industrial Welfare Work" was discussed by Lieut.-Col. R. W. Leonard, St. Catherines, Ontario, president of the Coniagas Reduction Co. and of the Canadian Institute of Engineers, after the luncheon on Monday, Mar. 17. Colonel Leonard extended, unofficially, greetings and best wishes on behalf of the latter organization.

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Mr. Clothier said that there were large sections of his district which were unexplored, and that it would be hard to find any of the mineral zones which were not likely to prove worth prospecting. His district extended from Seymour Inlet to the northern provincial boundary line, about 600 miles, to the entire width of the province at the north, and included the Portland Canal and Alice Arm districts, both of which possessed unexampled attractions both to prospectors and capital. In connection with the former he referred to the property commonly known as the Bush mine. recounted recent discoveries of high-grade silver-gold ore, and spoke of plans for extensive development next season. He also spoke optimistically of the Big Missouri and other properties in the same locality. Describing the Alice Arm District, reference was made to the Dolly Varden mine, with its promising silver and small gold contents.

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The Northeast of British Columbia was discussed by Mr. Galloway, whose district consists of 100,000 square miles of territory, within which are the Omineca, Cariboo, Quesnel, and Peace River districts. He gave a résumé of the mining operations of the past year, none of which had been of a specially notable character, because of high costs, and, latterly, owing to the unsettled market. He declared that the Skeena, Hazelton, and Telkwa sections were worthy of attention, having been prospected only to a small extent in comparison with their size and mineral possibilities. He emphasized the fact that there is a great unexplored area lying to the northeast, including the Peace River country, of which little is known and which might with prospecting yield good rewards.

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away. With 12 years set as the probable limit of time that Russia's supply might be expected to last, it was possible that, in the search for other sources, British Columbia occurrences might be given further consideration and a system devised whereby the platinum and copper ores would be analyzed and paid for by the smelters.

A. G. Langley, of the Eastern Mineral Survey District, said that there were 100 producing properties in his territory, and as many more developing. During the last few years operations had been resumed on many old workings, with good results, the silver-lead-zinc production of the district being of major importance. Much metal had been yielded by all the producing sections. The Standard mine had paid $2,700,000 in dividends; the Rambler-Cariboo, $500,000; and the Slocan Star produced, during a period of 12 years, ore having a total net value of $1,875,372. The Payne mine, which had been one of the largest producers, closed in 1904. Its discovery dated back to 1892, and it produced over 50,000 tons of silver-lead ore, representing a gross value at that time of nearly $4,000,000. Dividends paid between 1897 and 1904 amounted to $1,438,000. The mill concentrate during 1903 averaged 124.0 oz. in silver, 67.29% lead. These data were given to indicate possibilities.

"Among the properties which undoubtedly have made large earnings during the last year or so," Mr. Langley continued, "are the Surprise and Queen Bess. In 1916 Clarence Cunningham took over the Queen Bess, which had been idle for a number of years. Large bodies of ore were soon developed, and the mine has recently become one of the most important shippers in the district. The Idaho, Alamo, Sovereign, Wonderful, Van Roy, and Hewitt and Wakefield have since been acquired by Mr. Cunningham. A 150-ton concentrator, embodying the latest improvements in mill design, has been erected recently at Alamo. The rocks of the Slocan series have been found to inclose the largest and most profitable silver-lead deposits, so that their appearance in other sections of the country is of interest and well worthy of investigation. Although I do not know of any geological survey records which show correlation between the rocks of the central mineral belt of the Trout Lake Mining Division and those of other parts of the district, it is interesting to note that the richest silver-lead deposit in this region also occurred in dark carbonaceous and graphitic slates. Considerable tonnages of high-grade ore have been extracted from the Silver Cup, Netty L., Triune, and other properties. The ore is galena blende and tetrahedrite, carrying much silver. As an example, between the years 1901 and 1905, a total of 534 tons was shipped from the Triune, which contained gold, 0.9 oz.; silver, 250 to 400 oz.; lead, 33 to 50 per cent."

With regard to East Kootenay, Mr. Langley, after reciting the early history of the Sullivan Mine, now owned and operated by the Consolidated Mining and Smelting Co., said:

"This mine is now considered to be one of the greatest on the American continent. For a long time the problem of treating the complex zinc ores prevented large tonnages, high in metallic content, from being considered of commercial value. In 1918 a satisfactory solution of this problem was obtained, and many millions of tons of ore were added to the already large reserve.

"According to the management, by mining and treating this ore on a large scale, the company will be able to produce zinc and lead at a profit on any market price that existed in recent years, providing the price of labor and supplies falls with the prices of these metals. The long adit tunnel, which now has a length of nearly 8000 ft., is reported to be in ore; and preparations are under consideration for extensive improvements with a view to increasing the output.

"It is ridiculous to suppose that the East and West Kootenay districts have been thoroughly prospected, for such is not the case. This must be apparent to anyone who has traveled the mountains and is familiar with the nature of the country. It is still a young mining country, and, if market conditions remain favorable, we should see an increase in production during the next few years. What is needed is more capital and more prospectors. There are still many properties which were successfully operated some years ago and are now lying idle. These are, no doubt, worthy of careful investigation, as they may contain ore which could be developed and worked profitably under existing conditions. For such enterprises, capital is needed as well as for the development of new prospects. Again, there are a number of small deposits, carrying high-grade ore, which are not suitable for working on a large scale, but which could be successfully mined by two or three men. These properties are often worked under lease and bond, and substantial profits are sometimes made."

The Britannia Copper Mine

W. M. Brewer, of the Western Mineral Survey District, drew attention to the fact that within this area was the Britannia mine, one of the most important copper mines of the British Empire, and a monument to the late G. D. Schley, of New York. The district possessed a great diversity of mineral resources, including coal, ores carrying copper and gold, iron, silver, lead, manganese, and molybdenite, and also limestone for cement, quicklime and flux, marble, building stone, clay, talcose, slate suitable for some of the various purposes for which talc is generally used, and graphite, on Harbledown Island.

After dealing with the coal production of Vancouver Island (the output for 1918 was 1,666,582 long tons), Mr. Brewer asserted that the district presented an excellent opportunity for the prospector, who would, nevertheless, have to be prepared to tackle a few difficulties. He would have to be a fair boatman and know how to handle a canoe, be able to use an ax, a crosscut saw, a rifle, and a fishing rod. The various lakes, sounds, inlets, and small bays afford protection and shelter in case of storm and provide unsurpassed transportation facilities, as well as excellent fish food.

The coast range of mountains on the mainland, and sections of the west coast of Vancouver Island, were, in Mr. Brewer's opinion, the most promising to the prospector. As to possible rewards, he noted that, since the original Britannia group was located, in 1897 or 1898, the company had purchased about 350 claims, nearly all of which were staked by prospectors some years ago, paying for them about $1,000,000. As to the best places for the investment of capital, Mr. Brewer mentioned Quadra Island, Texada Island, the Lucky Four group, in the Cheam Range; the Big Eye group, near the head of Great Central Lake and in the Alberni Mining Division, and the Ptarmigan group, adjoining the Big Eye. The last three groups of mineral claims, he said, required large expenditures of capital for development, but all gave promise of eventually develop-

ing into such extensive properties as are in favor with the big operators. Texada Island also was a promising field for investment. Here the type of deposits had been proved to maintain continuity to a considerable depth, and other conditions, such as transportation facilities, were as nearly ideal as could be imagined.

Mining as an Investment

"Mining as an Investment" was the subject of a paper read by T. A. Rickard, editor of the *Mining and Scientific Press*, of San Francisco, in the evening. Couched in simple but forceful language, interspersed with a few strikingly apt narratives, and replete with the keen observations of a capable mining engineer of many years of activity, his address was clear and extremely informative. To the layman investor it was an education. "Of well-conducted mining ventures it can safely be said that they meet with a measure of success as large as, if not larger than, an ordinary manufacturing enterprise," observed Mr. Rickard at one point. "Yet mining," he continued, "has been and still is a glorious adventure for the youth of the world—for those young in spirit as well as in body." While the spirit of adventure was natural and vital to this industry, yet mining, properly conducted, was not a gamble. Naturally there was some risk. No sane man would expect to escape it. The idea of avoiding risk in mining was a pathetic fallacy, a weak endeavor to escape the inevitable. The attempt to find mines that would involve no risk to the capital sunk in them had tended to cripple the industry; and the refusal of many so-called exploration companies to incur risk had stultified their operations and paralyzed development.

"When the ore reserves of a mine are at low ebb," continued the speaker, "it may be the most speculatively attractive time to buy the property. There are those who say that the mining of the future will be the economic harvesting of the known ore deposits of low grade, the beneficiation of the masses of mineral already discovered, but heretofore regarded as too refractory for successful metallurgical treatment. That is, the utilization of the visible supply of skimmed milk, instead of finding the metallic cream concentrated by the patient operations of nature. I doubt that. The world is still young and but half explored, a fact substantiated by such discoveries as those of Nome, Cobalt, Porcupine, Tonopah, Goldfield, the United Verde Extension, the Bawdwin Mines of Burma, and a host of other bonanzas of the last 20 years.

"Before a profitable outcome is assured, every mining enterprise must pass through several speculative stages as surely as a child must take the chances of bumps and bruises. The history of the great mining deposits of the Rand, in South Africa, has not escaped the vicissitudes latent in mining which resulted in widespread loss of money. Between 1911 and 1918 the market value of the shares of the three principal companies, representing consolidations of groups of mines, declined $203,931,610, this loss being due to ignoring the common experience that mines eventually become impoverished in depth just as surely as men grow old."

More Money Made by Selling Than by Buying

Mr. Rickard asserted that the biggest fortunes in mines were made during early stages of development. On the whole, more money was made by selling than by buying mines, because the final so-called investment stage of a first-class mine is likely to represent an over-valuation. He ventured to say that more money was lost by over-valuation of rich mines than by worthless prospects. Small men lost their money in big mines; big men in small mines. The most intelligent policy to follow in investing in mines was to allow a liberal margin both ways, taking a larger risk for the sake of a larger gain.

"The sampling of mines," Mr. Rickard went on, "has been allowed to obscure the need for good judgment. It is also another phase of the attempt to make an investment out of a speculation. The ore in reserve in a mine should be regarded chiefly as an indicator of the probability of being able to find and develop more ore of the same grade. The expectation of a profitable venture should be based, not upon the extraction of the known ore, but upon the chance of further intelligent search. It is the spirit of adventure that stimulates the best kind of mining.

Mining Ventures Meet With Average Measure of Success

"The speculative side of mining has an attractiveness that is at the bottom of the energy with which it is followed, and, when brought to the dead level of a steady investment, you will find that the man of ordinary shrewdness saves time by going straight to his broker and buying bonds or consols. This does not mean that one is justified in playing the fool and expecting miracles to happen. The risk of mining should not needlessly be increased. Mining enterprises come to grief often, not so much because of the failure to attain an investment basis, but because they are not put on a business basis. Even if the occurrence of ore in nature is erratic, and mining as a consequence be hazardous, there is no justification for piling human foolishness on top of nature's vagaries.

"Of well-conducted mining ventures," concluded Mr. Rickard, "it can be safely said that they meet with a measure of success as large as, if not larger than, ordinary manufacturing enterprise."

H. N. Lawrie, chairman of the Oregon Bureau of Mines, was the first speaker when the convention reassembled on Mar. 18. His subject—"Gold"—was treated in an informative and entertaining manner. The attitude of "watchful waiting," adopted by so large a proportion of potential developers, was likely, he said, to cause economic distress, and it was his opinion that the mining industry offered a magnificent field in which to utilize returned soldiers. With the assistance of a number of charts, Mr. Lawrie gave an account of the gold production of the world, paying a high tribute to the British pound, its stability, and its universally recognized value. The elimination of artificial barriers of trade, such as excessive exchange rates, was necessary for future development, Mr. Lawrie contended, and an essential to progress was true freedom of trade. The solution of the present problem was "business as usual," development and production. People who were waiting, almost expecting, a general revolution, cancellation and repudiation of debts, and the adoption of new economic standards, were mistaken. Bolshevism was a danger that this waiting and watching in industrial movement tended to assist. The right backfire against Bolshevism was industrial activity that would provide proper employment at right wages.

Discussing the world production of gold, Mr. Lawrie said that it was a matter of common knowledge that the high production of the year 1915—$469,000,000—had

been followed by a steady decline. In the United States the falling off in production had been due to labor and machinery increases, and to other wartime factors. Besides, a slackening had been caused by the depreciation in the purchasing power of gold.

With reference to the commodity prices for the next two years, the speaker expressed the opinion that there would be no drop. The fact that people were waiting for such an occurrence was creating stagnation. Credit and currency must be extended to meet the conditions. "Generally speaking," he continued, "we are marking time at a moment when we should be busy. The boys are coming back from the front, better men, men trained to activity. They do not want to take part in this marking time; they want to see action. The mining industry is one of the best in which these men can participate. In peace times the mining wage is always at the top. It is a clean business. It is an outdoor business."

In course of the discussion which followed, Mr. Rickard uttered a warning against the suicidal action of hoarding gold, declaring that a strong display of confidence was essential in successful reconstruction.

"Government Control of Smelteries" was the subject of an able paper by Sidney Norman, of Spokane, who, referring to conditions in the Northwest, said that in years past the utmost good feeling had prevailed between operators and the management of the Trail smeltery of the Consolidated Mining and Smelting Co. of Canada. More recently, however, this sentiment had changed to one of distrust. He did not know whether there was any sound ground for the disagreement, but believed that government regulation of this plant, and of other smelteries, would have the effect of clearing the atmosphere and of benefiting the mining industry. If the smelters were making no more than a legitimate profit, they would have no cause to fear such regulations. If, however, they opposed the proposal, the inference was clear. He did not wish to be understood as favoring government ownership of smelteries—that would be a calamity. Government regulation through the medium of experts, however, was a different thing. British Columbia was to be commended in having the finest mining laws on the continent, and it was fitting that her government should take the lead in this matter. The closing of the smeltery at Greenwood by the Canada Copper Corporation gave the government the opportunity of establishing an operating smeltery on such a basis.

Smaller Sizes of Coal Merit Wider Market

"The Better Preparation and Utilization of Coal" was discussed by G. W. Evans, coal mining engineer, of the Northwest Experiment Station, U. S. Bureau of Mines, Seattle. His plea was for the greater use of the smaller sizes of coal, largely disregarded both by producer and consumer. It was well known to operators, both of British Columbia and Washington, that the percentage of large sizes is decreasing and that of small-size coal increasing. This change had been brought about partly by the inferiority of coal mines of today as compared with those of former years. As, however, it must be recognized that the percentage of lump coal would decrease and that of small sizes increase unless new coal fields were discovered, preparations should be made to make more small coal and to offer it to the public in the cleanest possible condition. He then discussed the best means of getting good results in the washing of coal, emphasizing the importance of the proper design of washer, the necessity of paying attention to the efficient operation of jigs, and the utility of the "float-and-sink" method of testing. Giving examples of how and to what extent savings might be obtained in British Columbia and the State of Washington, he said that he had seen 80 lb. of white rock picked from seven tons of coal that was supposed to have been cleaned. This occurred in Washington.

As to the value of the small coal, Mr. Evans gave attention to the use of powdered coal for fuel purposes, referring to its increasing popularity, and asserting that, with proper development, this branch of the coal trade in the Northwest might be expected to drive much of the imported fuel out of the market, thus permitting its use elsewhere. The oil supply of the world, he said, was limited, and should be conserved. The coal reserves of the Northwest, however, were sufficient to meet the needs of the Pacific Coast for hundreds of years. Francis Glover, of the Princeton Coal and Land Co., followed with some practical suggestions along the same line, among which was that the government should appoint engineers to see that wasteful methods were not adopted in the extraction of coal.

The Encouragement of Prospecting

"The Prospector, What He Should Be and How To Assist Him," was the theme of a discourse by John McConnell, who, after referring to the absolute need of the prospector in a mining country, recommended that the citizens of Vancouver, Seattle, and other centers might invest more generously in the grub-staking of these men. It was a gamble of a most fascinating nature. Because of the complex character of much British Columbia ore, the prospector and the small operator should be assisted by the establishment by the government of ore-testing mills. One plant should be an adjunct to the scientific department of the University of British Columbia; another should be placed at Nelson, B. C., to serve the Eastern mining divisions; and a third at a point in the Northern interior. He recommended that these plants be under the direction of skilled metallurgists, who would, in turn, be under the control of the provincial mineralogist. Two concentrating plants also were recommended by Mr. McConnell, one to be at Hazelton, B. C., or some other suitable point in the northern silver-lead district, and another in the Kootenays, preferably at Nelson, B. C., to cover the southern galena belt. Mr. McConnell suggested that a course of mining for the special benefit of prospectors should be arranged by the University of British Columbia. Another recommendation was that the provincial government, in dealing with the returned-soldier problem, might consider the advisability of grub-staking those soldiers who would prefer prospecting to going back to the land, for one or two years.

Taxation of Mines

"Taxation of Mines" was the subject of a talk by Valentine Quinn, of the Granby Consolidated Mining and Smelting Co., and also T. W. Bingay, of the Consolidated Mining and Smelting Co. of Canada. They were followed on the same question by Nicol Thomson, chairman of the mining committee of the Vancouver Board of Trade. Mr. Quinn argued that interest on capital employed is a fair and equitable charge on the income its employment produces, and therefore should not be taxed. In explanation it may be stated that this is not conceded by the income-tax law of the province in its application to mining companies. The

speaker emphasized the possibility of considerable difficulty arising in the obtaining of outside money or capital for investment in British Columbia mining enterprises if the course of making no allowance for interest on bonds in taxation were pursued. "If a refinement of the income-tax act could be secured," he concluded, "eliminating the indeterminate basis on which it is proposed to assess the mining industry, and taking into account the necessity of not only inducing new capital to come into the province but permitting the repayment of capital already invested to be periodically provided for, as well as to receive a reasonable return on its use, say 7%, before determining the taxable income, it would go far toward developing the financial end of British Columbia's mining industry."

Addressing himself to the same question, Mr. Bingay arrived at practically the same conclusion. He thought that the government should, in its taxation policy, exempt interest on borrowed capital in an estimation of what was termed taxable income. His opinion was that it would be more just and equitable to follow the lines laid down by the dominion government income-tax act, which applied equally to all individuals and to all corporations, regardless of the size of the income. "If an individual," he said, "derives income from investments in a company, the normal tax is collected at its source, and he does not have to pay the normal tax again on the same income." This was not the case in the province, he averred, the individual paying income tax first on the earnings of the company in which he was interested, then again on the same funds when coming to him in dividends. He thought, too, that there should be a deduction in figuring income of the salaries paid to nonresident directors and managers. In regard to the allowance of a maximum of 15% for mine depreciation, the government's position that there could not be greater depreciation was illogical. Mr. Thomson's opinion was that any mining taxation should be based on the net and not on the gross income, and that proper allowances should be made for such items as depreciation and development charges. Without such treatment, investors were likely to turn away from the province.

Abolishing the Fixed Price of Silver

A number of resolutions were discussed and indorsed by the convention before its adjournment on Tuesday evening, Mar. 18. One asked the Canadian government to use its influence with the British government to the end that the present fixed price on silver be abolished. Smith Curtis, of Kamloops, B. C., the mover, said that the authorities were not treating Canada fairly in this matter. She was losing between $4,000,000 and $5,000,000 annually. The present policy was unjust to the producer and to the country. Silver, like any other commodity, should, now that the war was over, be permitted to find its own level. If this were done, silver, indubitably, would rise well above $1 an ounce, possibly advancing to $1.50, certainly as high as $1.30 or $1.40. If the conditions were such that it might be expected to go below $1, it was almost a surety that the government restriction would be removed. Why should the producer be so discriminated against?

There was an enormous demand in the Orient and throughout Russia, and he upheld the right of the operators of British Columbia, as well as of other sections of America, to reap the rewards which conditions offered, because, under adverse circumstances, they had been and would be expected to stand on their own feet. G. A. Caldwell, representing the producers of the Boundary District of the province, spoke warmly in support of the proposal, terming the action of the few who argued that it was an Imperial question, and that the present policy had been acquiesced in by the United States at the behest of Great Britain in order that the economic equilibrium might be maintained in India, as a wielding of cudgels on behalf of the plutocrats. The resolution was carried.

S. S. Fowler, of Nelson, B. C., introduced a resolution proposing that the provincial government be asked to organize and equip an exploratory party for the purpose of exploring the vast northeastern section of British Columbia, of which little or nothing is known and which might possess mineral wealth that would repay a thousandfold the cost of such expedition. This also was indorsed.

Other resolutions which carried may be summarized as follows:

That the provincial government be asked to provide a more substantial financial vote for the carrying on of mineralogical, geological, and like educational work at the University of British Columbia.

That the provincial government be asked to provide an assay office and facilities for the analysis of ore at Prince Rupert, B. C.

That the Minister of Mines for British Columbia be requested to arrange for a tour through British Columbia of a party of British and American mining engineers, expenses of the same to be defrayed by the government.

That the Department of Trade and Commerce be requested to arrange for the filming of samples of British Columbia minerals and to use said pictures in connection with the advertising program it is now preparing.

That the Postmaster General of Canada be petitioned to remove present restrictions placed by the dominion on the importation of such second-class mail matter as representative American mining magazines.

That the "house-cleaning" campaign being inaugurated by the Spokane Chamber of Mines be indorsed. In explanation it may be pointed out that the mining interest attached to this proposal was given as being the fact that, if cities, large and small, began painting their buildings, public and private, so largely would the consumption of paint and its chief ingredient, lead, be increased that the present embarrassing surplus of the latter soon would be eliminated.

Fred T. Congdon, K. C., former member of the Dominion House of Commons for the Yukon Territory, addressing the convention delegates after the banquet of Tuesday evening, stated that it was a fallacy to suppose that the Yukon Territory and Alaska had been depleted in respect of their mineral possibilities. Both these vast territories offered splendid opportunities to the prospector and the operator. The climatic conditions, too, he asserted, were ideal. True, there were occasional "cold snaps," but, taking the year round, the temperature was nothing more than bracing.

Visit to Britannia Mine

Other speakers were A. C. Garde, of Prince Rupert, B. C., and M. J. Carrigan, of Seattle, Wash., the former confining himself to the mineral and general industrial possibilities of the Pacific Northwest, and the latter speaking of the potentialities of the iron-ore deposits of the province, to which reference has been made.

On Wednesday, Mar. 19, the convention was brought

to a close with a trip to the mine and plant of the Britannia Mining Co., which is situated within a day's return journey of the city of Vancouver. A special invitation was given the visiting delegates, and every opportunity afforded them to become acquainted, at least to some extent, with one of the largest and best-managed mining enterprises of America.

An account of the convention would not be complete without passing reference to the splendidly representative and informative collection of mineral samples, which came from all sections of the Pacific Northwest, and which occupied a prominent position in the Vancouver Hotel. Another exhibition which attracted attention was that of machinery used in mining operations, which was housed in the vicinity.

Officials of the British Columbia Chamber of Mines, too, should receive a word of commendation and congratulation. It was their first attempt at the organization and management of a convention on a large scale, and to their indefatigable efforts is due its unqualified success.

Manufacturing Detonators for Blasting*

Copper sheets are used in the manufacture of the shell or container which receives the detonating composition used in blasting, and these are placed under a punching machine, which cuts small circular disks from each sheet. These disks then pass into another machine which has a descending plunger that cups the flat disk. From the cupping machine the cups are conveyed to a drawing machine, which cups them still more and starts the formation of the shell. After passing through two more drawing machines, the copper is further drawn out and the shell formed with a rough top. This rough top it cut off smoothly in a cutting machine, and the shell is complete. The shells are then dumped into hoppers, from which, by pulling a lever, the operator can load them, 100 at a time, into block trays having holes, into each of which a shell fits in an upright position, ready to receive the charge of detonating substance.

The preparation of the different detonating agents is a rather intricate chemical process, and is attended with infinitely more danger. As an example, fulminate of mercury is made by mixing nitric acid, mercury (quicksilver) and alcohol in the proper proportions. A white residue, or precipitate, called fulminate, is the result of this chemical action. This fulminate is carefully washed to remove all impurities and excess acid, placed while still wet in small fabric bags, and stored in wells in the ground filled with water.

When wanted for use, the fulminate is removed from the water, taken to a barricaded dry-house, where gentle currents of warm air remove the moisture. Dried fulminate is very sensitive; hence the handling from this point must be done with extreme care. The dry fulminate is carried in small rubber-lined boxes to the dry-storage house, situated a considerable distance from the rest of the plant as a safety measure. From the dry storage, the fulminate is taken in small quantities to the mixing house, where it is mixed with the other detonating ingredients in the correct proportions in automatic, specially constructed vibrating machines. Thorough mixing is essential.

The mixed fulminate is then taken to the house, where it is filled by automatic machines into the copper shells held in the trays, and then to the press, which has 100 small plungers that fit exactly into each cap or shell. This gently presses the detonating mixture, and compresses it to a sufficient degree to keep it in the shell. Explosions are frequent in this step of the process, and the press is consequently surrounded by thick walls, and the operator remains outside during the operation, which, however, requires but a short time.

From the press, the loaded caps are conveyed in sawdust to rumblers and screens, where any loose particles of the detonating agent are removed along with the sawdust, and the blasting caps are ready to pack. They are first placed in felt-lined tin boxes, each holding 100 caps, then into heavy pasteboard cartons, and finally into strong wooden cases for shipment.

*Extracted from an article, "Detonators for Blasting," appearing in the April issue of *Du Pont Magazine*.

Bingham Mines Co. Annual Report

The 10th annual report of the Bingham Mines Co. for the year ended Dec. 31, 1918, shows that shipments from the Dalton & Lark mine amounted to 2391 dry tons of lead ore and 31,670 dry tons of copper ore, of a gross value of $220,200, comparing with a total of 25,776 tons, valued at $334,667, the previous year. The net smeltery returns were $144,602, compared with $234,966 in 1917. Lessees in the Dalton & Lark and Commercial mines produced 4862 tons, netting the company a royalty of $32,153. The contents of company and lease ore produced in both mines were: Gold, 1666 oz.; silver, 172,567 oz.; lead, 1,426,636 lb.; copper, 875,006 lb.; as compared with 2182 oz. gold, 227,975 oz. silver, 936,125 lb. lead, and 2,971,214 lb. copper in 1917. New work totalled 2755 ft. of drifts, crosscuts, winzes, and raises.

The Victoria mine produced 6790 tons, containing 1047 oz. gold, 139,308 oz. silver, 176,019 lb. lead, and 165,508 lb. copper, of gross value of $170,619, with net smeltery returns of $108,810. The amount of new work was 2313 ft. The Yosemite Mines Co. produced 2010 tons, containing 79 oz. gold, 10,188 oz. silver, 314,258 lb. lead, and 21,034 lb. of copper, valued at $29,577, from which net smeltery returns were $18,421. New work totalled 1799 feet.

The Eagle & Blue Bell Mining Co., a subsidiary, produced 40,369 tons, valued at $1,089,177, comparing with 34,457 tons, valued at $1,068,836, in 1917. The net smelter returns on this ore for 1918 amounted to $626,978, comparing with $714,867 in 1917. The contents of the ore produced in 1918 were: Gold, 2605 oz.; silver, 579,074 oz.; lead, 9,389,376 lb., and copper, 16,012 lb. The amount of new work in drifting, crosscutting and other openings totalled 5519 feet.

Silver King Consolidated Mining Co., of Utah, in its annual report for 1918, states that receipts from ore sale amounted to $275,968.48; stock sales, $266,265.31, and miscellaneous, $28,007.03. Together with the balance on Jan. 1, 1918, ($239,086.18), total receipts amounted to $809,327. Total expenditures were $762,618.62, and include development and mining, $97,773.92; tunnel account, $116,146.42; dividends, $70,000, and other items. Production of ore and concentrates for 1918 aggregated 5182 gross tons, or 4901 net tons, the gross value of which was $318,845.50. Deducting charges, (freight, $10,502.47, and smelter charges, $32,372.46), net value was $275,970.57. Progress at the Spiro tunnell was 4001 ft., which was made at an average cost of $25.508 per foot.

Industrial News from Washington

By Paul Wooton, Special Correspondent

War-Minerals Claims Exceed Appropriation

Judging from the rate at which war-minerals claims are reaching the Relief Commission, the total amount claimed will exceed greatly the $8,500,000 provided by Congress for adjustment purposes. The total number of claims received up to Apr. 4 was 89. These were divided as follows: California, 23; Oregon, 18; Colorado, 8; Arkansas, 7; Utah, 7; Minnesota, 5; Alabama, 5; Georgia, 4; Tennessee, 4; Montana, 2; Nevada, 2, and the following states 1 each: New York, Oklahoma, Pennsylvania, and Virginia. By far the greater number are based on operations for the mining of chrome. Manganese is in second place, and pyrites and tungsten are third and fourth, respectively. Many persons, evidently not knowing that the statute limits relief to the four minerals mentioned, are sending in claims based on nearly all mining activities. One promoter asked to be repaid for his expenditures in an effort to float war-minerals propositions.

At the request of California chrome producers, no interpretation will be made of that section of the law which limits claims to those where a direct "request or demand" was made by a Government agency, until they can be heard on the subject. One provision of the law is being overlooked by many who are filing claims. The law specifies that the work done must have been on the property which contains minerals in sufficient quantities to be of commercial importance. The burden of proof in this regard, therefore, is on the claimant.

Philip N. Moore, of the commission, calls special attention to the fact that it is not necessary for claimants to employ attorneys. The commission much prefers to deal directly with claimants, and will see to it that each has every opportunity to make his case as strong as he can. J. E. Spurr has been selected by the commission as its chief engineer. This work will be in addition to his regular duties with the Bureau of Mines. H. E. Meyer, former chief clerk of the Lake Superior experiment station of the Bureau of Mines, has been chosen as chief clerk of the War-Minerals Relief Commission. Mr. Meyer just has returned from duty with the army of occupation.

New General Import License

The War Trade Board announces that a general import license, to be known as PBF No. 36, has been issued, effective Apr. 7, 1919, covering the importation into the United States from Mexico, Cuba, Haiti, Santo Domingo, and all countries of Central and South America, except British and French possessions, of all commodities except pig tin, tin ore, tin concentrates, all metal alloys containing tin, nitrate of soda, emery, except that mined in Canada; salvarsan, neosalvarsan, arsphenamine, and all substitutes therefor and equivalents thereof; sugar, wheat, wheat flour, rice, peanuts, nitrate of potash, cocoa, coffee, rubber, tungsten ore, and wool.

Foreign-Trade Committee Formed

The State Department has organized a foreign-trade committee for the purpose of outlining policies for the Government's relationship to foreign trade. The mining industry is to be represented by J. E. Spurr, of the Bureau of Mines, who also represents the Interior Department on the committee, as well as the other interests coming under the jurisdiction of that department. This committee is distinct from the Economic Liaison Committee, which was organized recently by the State Department.

Anti-Trust Legislation

Impetus has been given to the movement to secure the reopening of the anti-trust question at the next Congress by the referendum just taken on that subject by the Chamber of Commerce of the United States. The referendum indicates that the overwhelming majority of American business men want to see the uncertainties of the existing laws removed.

Despite the fact that not many months ago the Chamber of Commerce brought out a scathing criticism of the Federal Trade Commission, the vote of its members is strongly in favor of making it the supervising body which would formulate standards of general business conduct. The chamber recommends, however, that the commission be enlarged and new members chosen from among men who would "bring to the commission a proper conception of its duties and purposes." Another reason given why the commission should be the supervisory body is that it has gathered invaluable information concerning industrial and commercial practice during recent times.

Panama Canal Freighting

Now that the nature of the cargoes passing through the Panama Canal again is being made public, it may be noted that minerals form a substantial proportion. The report covering the week ended Mar. 15 shows that cargoes of spelter are moving from Tacoma and Seattle to Gulfport, and nitrates from Calita Buena, Tocopilla, and Mejillones to San Juan, La Pallice, and Charleston, respectively. Copper, in addition to the movement from Chilean ports to New York, is being shipped from Portland, Ore., to France.

Pan-American Industrial Congress Proposed

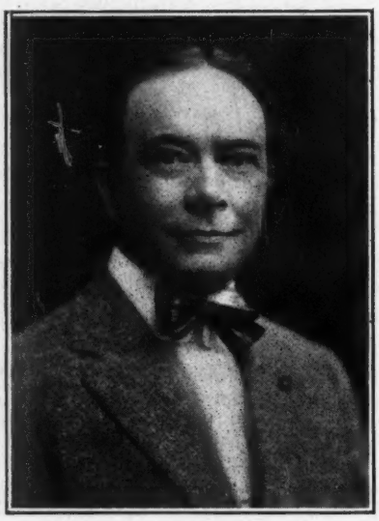
A Pan-American industrial conference fully as pretentious as was the Pan-American Scientific Congress held in 1915 is under consideration by the Pan-American Union. It is practically certain that such a conference will be held.

As mining is an important industry in Latin America, it will occupy a prominent place on the program. This will be the first conference of the kind to be devoted exclusively to the economic features of Pan-American relationships.

Joseph E. Johnson, Jr.

JOSEPH E. JOHNSON, JR., was killed accidentally at Hartsdale, N. Y., on the morning of Apr. 4. On the way from his home to the railway station he paused for an automobile to pass. The automobile skidded and struck him, knocking him down and fracturing his skull. He died an hour later without regaining consciousness. The news of this sad accident came as a shock to his host of friends in the profession and outside of it.

J. E. Johnson, Jr., was born at Longdale, Va., in 1870, the son of Major J. E. Johnson, who was the manager of the Longdale Iron Co. He was graduated from Haverford College in 1888. He received the degree of mechanical engineer from the same college in 1891, and in 1892 obtained a degree from Cornell University. In the meanwhile he had begun practical work, first as a draftsman for the Baldwin Locomotive Works. Having finished his studies at Cornell, he was engaged from 1892 to 1894 with the Straight Line Engine Co. and the Cranberry Iron and Coal Co. In 1894-95 he was assistant to the superintendent of the Ames Iron Works, and in 1895-99 was engineer and assistant manager of the Longdale Iron Co. Leaving that position, Mr. Johnson worked with the Carnegie Steel Co. in 1899-1901, being identified with its blast-furnace department. In 1901 he returned to his old position with the Longdale Iron Co., with which he remained until 1906. From 1906 to 1909 he was general manager of the Princess Furnace Co., operating blast furnaces, ore mines and a railroad. During 1909 and 1910 he was general superintendent for the Republic Iron and Steel Co. at Thomas, Ala., operating three blast furnaces and 900 coke ovens.



JOSEPH E. JOHNSON, JR.

From 1910 to 1913 Mr. Johnson was manager of the Ashland plant of the Lake Superior Iron and Chemical Co. at Ashland, Wis. In 1913 he opened an office as consulting engineer in New York, and had made this his headquarters since that time. This is a bare outline of his extensive and active career in work among iron mines and furnaces and coking plants. He gained comprehensive experience as a mechanical engineer, as mining engineer and as metallurgical engineer and was splendidly fitted for consulting practice when he entered it.

Previous to his entry into general consulting practice, Mr. Johnson had done much technical work of a major character, which had won for him high professional recognition. His remarkable versatility was exhibited in the variety and wide range of his interests. The introduction of a masterly method of mining, the designing of some ingenious mining machinery, the arrangement of a clever system of tramway transportation, the improvement in blast-furnace practice, the study of the quality of pig iron and the means for raising the grades, were all subjects that engaged his attention with distinctly useful results. He was a generous contributor to the technical press and described his work and offered his ideas in papers in the *Journal, Chemical and Metallurgical Engineering*, the *American Machinist, Iron Age*, and the Transactions of the American Institute of Mining Engineers. Besides these contributions, which were invariably noteworthy, he was the author of treatises on "Blast-Furnace Construction in America" (1917), followed by "The Principles, Operation and Products of the Blast Furnace" (1918). In his preface to the former work he said: "I happen to have made several investigations which served to explain some of the phenomena of the blast furnace not previously understood, and it seemed proper that the results should be recorded. . . . In many cases my opinions are given for what they may be worth, because it seems to me that those books which simply give a number of opinions without any indication of the author's preference are of little real use." This expression was thoroughly characteristic of the man.

The best efforts of Johnson's leisure for more than three years were spent upon this book, which dealt chiefly with the mechanical side of the blast furnace. It was written in that exact and clear language that was characteristic of its author, which made it easy for everyone to read and put it within the grasp of any intelligent furnace-man. The succeeding treatise exhibited the same admirable qualities.

In a review of "Blast-Furnace Construction" by Bradley Stoughton, than whom no one is more competent to pronounce an opinion, Johnson's professional status was excellently summarized in the following paragraph:

"Probably no living person is qualified for so many different reasons to write a book on this subject as is J. E. Johnson, Jr. His father was an important American ironmaster, and this author may be said to have been born and bred around a blast furnace. For more than 20 years he has held a prominent position as operator, inventor, author, and interpreter. Two of his achievements in the latter capacity would alone be sufficient to place him in the first rank of modern scientific interpreters; namely, his theory of the constitution of cast iron, which has since been expanded and elaborated by himself and others, and his theory of the critical temperature of the blast furnace, which is now generally accepted as the explanation of the saving effected by drying blast, which was once considered (especially by German theorists) as super-theoretical and, therefore, impossible."

In his work as consulting engineer Mr. Johnson found a wide field of activity. One of his recent important works was a professional mission to China. Just previous to his untimely death he had been devoting him-

self to a new study in the metallurgy of iron, in which he was intensely interested and as to the successful outcome and practical value of which he had great hopes.

Personally, Mr. Johnson was a most lovable character. He had a natural gift for making friends, all of whom enjoyed him immensely. He was a broad-minded man, whose interests were far wider than those of his profession. He was a good citizen. He was a wonderfully clear thinker, and his views were invariably characterized by a striking originality. Added to this was his art of frank, clear, and illuminating expression. A sleepy meeting always woke up promptly when Johnson rose to make any remarks. There is nobody to fill the chair that he has left vacant.

Mr. Johnson was a member of the Mining and Metallurgical Society of America and a member of the board of directors of the American Institute of Mining and Metallurgical Engineers, in which he was marked for high honor. He resided in a beautiful old-fashioned home at Hartsdale, where he leaves a widow and a young son. W. R. I.

Chronology of Mining for March, 1919

Mar. 1—Arizona Copper Co.'s mines in Clifton-Morenci district of Arizona placed on a five-day per week and wages at 18c. price for copper basis, with bonus of $1 per day for underground men and 75c. for surface men.—Further reduction of 25c. per day in miners' wages effective in Bingham district in Utah.—Sliding scale of wages based on price of copper effective at the Granby Consolidated Mining, Smelting, and Power Co., in British Columbia, with a bonus arrangement.—Price of copper declined below 15 cents.

Mar. 8—Employees at the Garfield smeltery of the A. S. & R. Co. returned to work.

Mar. 13—Announced that English government plans creation of permanent petroleum ministry to act as adviser for all departments, to have control of all territory within the empire, and advise and assist British companies or individuals in obtaining concessions and leases in foreign countries.

Mar. 14—Calumet & Hecla passed its dividend; stock declined 50 points.

Mar. 16—Reduction of $1 per day in miners' wages in Cœur d'Alene district.

Mar. 17—International Mining Convention held at Vancouver, B. C.

Mar. 18—Pumping of first well started at property of Texas Gulf Sulphur Co., at Gulf, Matagorda County, Tex., and production of sulphur began the following day at rate of over 400 tons every 24 hours. On Mar. 23 second well started to produce, the two wells making about 1000 tons daily.

Mar. 19.—Arguments heard in U. S. Supreme Court in Washington, D. C., on appeals by Minerals Separation, Ltd., from Federal court opinions denying injunctions to restrain Butte & Superior Mining Co. from infringing flotation process patents.—Walter Renton Ingalls, who was Editor of the *Engineering and Mining Journal* for nearly 14 years, retired from that position and reëntered professional practice as consulting engineer, retaining, however, his connection with the *Journal*, as Consulting Editor.

Mar. 20—The transport "Dakotan" arrived in New York, with 43 officers and 1349 men of the 27th Engineers.—J. P. Morgan & Co. notified by British government to discontinue buying of sterling exchange.

Mar. 21—Price reduction effective for iron and steel as agreed upon between the Industrial Board and general committee of the iron and steel industry.

Mar. 26—Sterling exchange drops to 4.615.

Mar. 28.— Fire occurred in Argonaut mine in Jackson County, Calif.

Mar. 31—Sale of Mother Lode Copper Mines Co., of Alaska, to Stephen Birch permitted by Supreme Court of the State of Washington.—Trading in copper was begun on the New York Metal Exchange.

Sale of American Metal Co. Stock

The sale of 562 shares of the Compañia de Minerales y Metales, S. A., which is less than 3% of the total capitalization, and 34,644 shares of stock of the American Metal Co., Ltd., which is 49% of the capitalization, which securities were seized by the Alien Property Custodian because of German ownership, took place in the offices of the company, at 61 Broadway, New York, on Monday, Apr. 7, at 10 a. m. After the usual preliminary legal formalities had been observed, the 562 shares were put up in one block. The bidding was started by Howard Walter McAteer, who stated he "represented a syndicate," at $28,000. C. M. Loeb, president of the American Metal Co., was the only competing bidder, and the price was bid up in $1000 advances to $57,000, by Mr. McAteer, at which price the block was knocked down to him. Mr. Loeb withdrew with a bid of $56,000.

The 34,644 shares of the American Metal Co., Ltd., were also put up in a single block. Mr. McAteer started the bidding at $50 per share, and keen competition developed between him and Charles Hayden, of Hayden, Stone & Co., the only other bidder, who stated he was "acting for himself and associates." Mr. Hayden finally purchased the stock at a bid of $140 per share, which represents $4,850,160 for the whole block. Mr. McAteer is president of the American Steel Export Co., 233 Broadway, N. Y.

American Electrochemical Society

The general meeting of the American Electrochemical Society was held on Apr. 3, 4, and 5, at the Chemists' Club, New York. More than 200 members and guests were in attendance. On Thursday, after the annual business meeting held in the morning, the following papers were presented in abstract and discussed:

E. F. Northrup: "Principles of Inductive Heating With High Frequency Currents." Gustave Gin: "Uranium." H. D. Braley: "Notes on Electrostatic Precipitation." G. G. Griswold: "Electrolytic Silver and Gold Refining at Perth Amboy." G. A. Guess: "A Process for Electrolytically Refining Nickel." O. P. Watts: "Electroplating on Iron From Copper-Sulphate Solution." O. P. Watts: "Remarkable Pitting of Electroplating."

C. F. Carrier presented an important paper on the Nelson electrolytic chlorine cell. The importance of this cell may be judged by the fact that over 8000 have been installed. In the Government plant at Edgewood Arsenal, Baltimore, Md., more than 3500 Nelson cells were installed for the production of 100 tons of chlorine gas per 24 hours. Mr. Carrier described the developments of the cell and said that it is not claimed that absolute perfection had been attained, but that it is

believed that the cell has reached a stage where experiment and abstract theory are things of the past.

The papers presented on Friday were:

W. H. Walker: "The Edgewood Arsenal." O. Hutchins: "Silicon Tetrachloride." G. A. Richter: "The Role Played by Silicon and Titanium Tetrachlorides During the Past War." A. B. Lamb: "Portable Electric Filter for Smoke and Bacteria." E. Gudeman: "Chemical War Secrets and Releasing Manufacturers' Reports." W. L. Argo, F. C. Mathers, B. Humiston, and C. O. Anderson: "Preparation of Fluorine." R. E. Wilson and W. G. Horsch: "An Electrolytic Process for Production of Sodium Permanganate From Ferromanganese." A. G. Reeve: "Lead Plating of Shell Interiors and Boosters." B. G. Klugh: "Electric Furnace Manufacture of Silico Manganese." T. F. Baily: "Electric Furnaces Used in the Production of Essential War Materials."

On Friday evening a smoker was held in Rumford Hall. On Saturday the members and their guests visited the plants of the Loose-Wiles Biscuit Co., the Wright-Martin Aircraft Corporation and Nichols Copper Co.

Initial Relief-Commission Hearing

WASHINGTON CORRESPONDENCE

The initial hearing before the War-Minerals Relief Commission will be held in Washington on Apr. 15, and the claim which will come before the commission at that time is that of the Chestatee Pyrites and Chemical Co., Chestatee, Hall County, Ga. As this is the first hearing and will disclose the procedure which will be followed in subsequent cases considered by the War-Minerals Relief Commission, it will be followed with special interest.

Industrial Representatives at Capital

Government officials having to do with matters pertaining to the petroleum industry are anxious that the newly formed American Petroleum Institute should establish its headquarters in Washington. With few exceptions the important industries of the country are represented in Washington by organizations which are prepared to give immediate information concerning any phase of their activities. By the close touch that is maintained, the bureaus are able to direct their work so as to afford the greatest possible benefits to industry. The committees of Congress engaged in formulating legislation find that it is a great help to have immediately at hand representatives of the industries which will be affected. Their point of view often prevents embodiment in bills of obvious injustices.

British Molybdenum and Tungsten Markets

The following is a letter received at my Paris office from Everitt & Co., of Liverpool, referring to the molybdenum and tungsten ore market in England. The letter is so timely that it should interest your readers:

"We beg to acknowledge receipt of your letter, and note what you write regarding your New York house being able to offer monthly productions of molybdenum sulphide, and also wolfram ore.

"Unfortunately, since the armistice has been signed, the position of these minerals is in a precarious state, and, naturally, as the tungsten steel is required more or less for shell turning and other munition work, with the cancellation of government contracts the steel makers are overstocked with tungsten steel, as also with tungsten metal, and the country is overstocked with tungsten ore.

"As you are probably aware, as far as this country is concerned, the British government made arrangements to take all the ore from our colonies at a fixed price for six months after the signing of peace, and what with the large stocks that are held on government account, and by private firms, and the bad position at the present time with consuming works, there is more ore in the country than one knows what to do with. The government has reduced its price to the actual makers of the tungsten metal to 40s. per unit of tungstic acid in the ore, and we should not be at all surprised to see the price drop before long considerably, and as the government is committed to take all the ore from the mines abroad at a fixed price for six months after peace is signed, this means that the mine owners abroad will send ore into the country as rapidly as they can mine it, and as far as we can see there will be stocks to last for at least two years.

"As regards molybdenite, the position is somewhat similar. The demands for this ore are erratic, and although there was a fair demand during the war, this has fallen away to practically nothing. Prices for this mineral are, of course, high, and when one considers that in 1911 and 1912 the price was about 30s. per unit, it can readily be seen that prices will have to drop considerably in the same way as did those of wolfram ore, and we think it will be a long while before the market gets brisk again in this mineral."

New York, April 18, 1919. MARK R. LAMB.

The Enemy Trading List

Announcement has been made by the War Trade Board that a revised Enemy Trading List for Mexico, Cuba, Haiti, San Domingo, and the countries of Central and South America has been issued which supersedes all previous issues. Persons within the United States may now trade and communicate with individuals, firms, or corporations whose names were contained in previous issues or supplements of the list but which are not included in the present revision, provided such individuals, firms, or corporations are not believed to be trading, directly or indirectly, for or on behalf or on account of any of the individuals of firms now listed.

The provisions of the Trading With the Enemy Act continue in full force and effect with respect to the houses included in this revised list and parties acting on their behalf, and the Bureau of War Trade Intelligence is prepared to answer inquiries concerning any parties to a proposed transaction.

The restrictions heretofore existing with regard to the importation of ferromanganese and spiegeleisen, as included in List of Restricted Imports No. 2, Item 114, have been removed, effective Apr. 1, 1919, according to an announcement of the War Trade Board, and licenses to import these commodities will now be issued freely when the applications are otherwise in order.

Importation of these commodities from the United Kingdom, France, Italy, Belgium, or Japan, or from their possessions, protectorates, colonies, or dominions, may be made under General Import License PBF, 34.

Editorials

Joseph E. Johnson, Jr.

THE sudden death of Joseph E. Johnson, Jr., the result of an accident, coming as it did soon after a meeting of the New York Section of the Mining and Metallurgical Society of America, which he attended, greatly shocked his many friends and associates and left everyone deeply moved. The members of the Mining and Metallurgical Society of America and the American Institute of Mining and Metallurgical Engineers held Mr. Johnson in the highest esteem, both for his technical knowledge and on account of his fine character. The richness of his personality and his charm drew many admiring friends to him. His cheerful, happy smile made the meetings of the local sections of both engineering societies which he attended especially enjoyable. He will be greatly missed, and long will he be remembered.

The Workers' Right To Choose

AT THE recent meeting of the New York Section of the Mining and Metallurgical Society of America, Meyer Bloomfield placed special emphasis, in his discussion of the labor question, upon the effectiveness of the conference method for preventing disputes and settling difficulties in industrial plants. More and more, he said, would the trained labor expert be called upon to advise engineers upon the delicate questions that provoke trouble between wage earners and plant managers. Upon the engineers and managers rests the responsibility for meeting the issues by applying new methods that are based upon equity and fair play. Paternalism and the older system of dealing with labor have had their day, and are no longer effective.

There was much of good sound sense in what Mr. Bloomfield said. With the conference method many engineers are in accord, and there are few intelligent engineers who are averse to making full use of it in the plants that are under their control. It is good business to have well-lighted and properly ventilated working places, clean and well-ordered plants, proper conveniences, good water, good housing facilities, and adequate protection against accidents. Aside from being good business, it is, as Mr. Bloomfield said, to be expected of good management.

Not only should the workmen be encouraged to feel that they have a vital interest in their work, but they should be taken into the confidence of the management in matters where they can assist by reason of their more direct contact with the actual working conditions.

In matters pertaining to so-called welfare work, the workmen themselves should be called into consultation as to the plans that are proposed. Only such changes should be initiated as receive the sanction of the workers. In other words, those who are to be welfared should have a chance to say whether they desire it or not. Much of the resistance that arises against good measures can be overcome by tactfully arousing the initiative of the workers and causing the suggestion for improved working conditions or for certain features of welfare work to emanate from the employee rather than from the management of the welfare division.

With the suggestion of Mr. Bloomfield, that social benefits developed from the bottom up and with full coöperation of the workers to be helped are more lasting, few will disagree. What is wanted are not theoretical and Utopian plans, but an intelligent stimulation of the worker himself to undertake partial responsibility, at least, for the measures that are evoked for his safety and welfare.

Steel Prices and the Railroads

ACCORDING to recent accounts, Walker D. Hines, Director General of Railroads, on behalf of the Railroad Administration has refused to abide by the reduced steel prices fixed by the Industrial Board of the Department of Commerce. The Railroad Administration is energetically seeking a way out of its jungle of deficit. To avoid the reduction of wages and salaries, it is basing some of its hopes upon the opening up of a pathway marked by the reduction in price of certain commodities which it uses in large amounts.

The steel industry is seeking to stimulate market demand for its products by lowering prices, but at the same time trying to avoid lowering them to such an extent as to imperil the ruling wage rates in the industry. The effort of the Department of Commerce in conjunction with the steel industry had for its object the stabilization of prices for a definite period.

Both the steel industry and the Railroad Administration wish to avoid interference with existing wage rates. The Railroad Administration has raised its freight and passenger rates and has reduced service. Between raising rates again and paying less for its necessary supplies, it has chosen the latter course.

It is difficult to see a way out of the dilemma. We believe that steel prices must be materially lowered before demand is increased to a sufficient extent to effect a considerable increase in building and general industry. The prices of other commodities that are maintaining a high price level must also come down. The heavy burden of taxation, the current Liberty loan, and the slackening in the volume of industry make further increase of railroad rates a severe remedy, but the rapidly increasing deficit of the railroads may cause the Railroad Administration to resort to it.

It is becoming clear that substantial price reductions in a moderate number of commodities and slight reductions in others will not work. What is wanted is a horizontal reduction that will affect the basic commodities all along the line. Mr. Hines is taking a justifiable stand in respect to steel prices, but he cannot long delay in reaching the conclusion that the position of the Railroad Administration and the railroads is like that of any other industry. A material increase in service or a decrease in rates is just as necessary under present circumstances as is the reduction in the prices of steel and iron commodities.

Business as Usual

HOW many mining company presidents could advise inquiring stockholders to the effect that the phrase "business as usual" expressed the state of affairs at their property? We venture to say that the list would be small, if any such list could be compiled.

We are all keenly anxious to see the day when we can write "business as usual," but most of us are groping in the dark for some means of doing our share toward bringing about this condition. "Get to work," "Place orders," "Don't let your plants lie idle," "Don't discharge your employees"—these are expressions typical of the advice offered, none of which seems to apply to the producer of metal, who must find a market for his product and meet his payroll and supply bills.

When industry was moving on the up grade a few months ago, every branch of it, through the excessive demands for all sorts of material, contributed its quota toward the general increase in the cost of supplies and labor, sometimes without due regard of proper proportions, and sometimes, we fear, without much respect for justice and with little thought of the day when industry would have to move on the down grade again.

Labor and capital both hesitate to take the initiative in turning backward and coming downhill slowly together, with brakes gently but firmly set. Several industries having only old-fashioned hand brakes have hesitated to make any move. They have come to a standstill, the crews are quitting, and there is a possibility of disaster.

Is there no industry in which we are all interested that could take the initiative, and by its precept and example lead us out of trouble? Our first thought is, "Why, yes: farming." "By reducing the price of our food the farmer could enable all of us to live at a lower cost than we do now; and, as high cost of living is our main trouble, we would soon be in normal times again."

All very beautiful; but the producers of food form a vast army which fixes prices through the law of supply and demand, and it will not be inclined to do any lowering of prices until the demand falls off. There is a very large demand for food in Europe, and so long as such markets are open to our farmers, and so long as there are ships to carry the goods, the farmer will not help us out of our trouble.

How about the railways? Can we look to them to start anything? No, the railways are no longer free-acting corporations. The United States Government is running the railroad business. If the railway companies were free to act, they could, possibly, lead us down intelligently and more carefully than the directors of any other industry. Every man, woman, and child in the country is directly or indirectly interested in the service rendered by the railways; every miner, farmer, mechanic, and preacher uses the service to some extent. An advance in rates or wages is felt by all of us immediately. We have never had a reduction in wages and seldom one in rates, but the opinion might be ventured that we would all benefit by this move likewise.

The Government, by a stroke of the pen, advanced rates and wages. The impositions were suffered with little comment, for the money was needed. The Government could, with equal propriety, reverse its order, but it will not do so. It will be afraid to do this, but what it can do, and what it must do, sooner or later, and what it should do at the very earliest moment possible, is to determine what it is going to do respecting the railway question. This is due the owners and the employees of the railways, and due to all who use the service of the railways—to every American citizen. A mistake will be preferable to inaction, for mistakes may be rectified. Inaction cannot be justified; its losses are irrevocable.

The Miner's Solace

THE cranks are assuming an attitude of belligerency, and the latest proposal, made apparently in all seriousness, threatens to place smoking among offenses against the law. Such an excursion into the rights of a free people can, of course, result only in shipwreck; but, nevertheless, the ventilation of the subject is pertinent, in view of the absurd claims and contentions being made by the sponsors of the new movement.

Liberties that are inimical to our well-being or to the well-being of the state are disadvantageous. The decision with regard to alcohol was accepted in good grace, and by the great majority, as a step in the right direction, and one which must inevitably put the United States well ahead in the race with other nations. But alcohol is a drug, and its value as such is mainly dependent on previous abstention. The ill-effects of immoderation, on the mental, moral, and physical faculties, are too well known to need reiteration. The results of alcoholic excess on national life are such that it is imperative that those whose inclinations are always under firm control must sacrifice much of their personal liberty of action to help the nation to attain a high ideal of national sobriety and progress.

With tobacco no such ill-effects are evident or likely, and an attitude of prohibition with regard to smoking can be regarded only as an altogether unnecessary proposal to encroach on personal liberty, engineered by a group of persons whose purpose is to deprive the remainder of humanity of everything that appears, to their jaundiced view, to be objectionable. Tobacco smoking cannot be classed among pastimes that are harmless, for the simple reason that no such category exists. If looked at from the same queer angle, nothing—absolutely nothing—is harmless.

A love for "My Lady Nicotine" is far from being degrading, and smoking may well be classed among the least objectionable and least harmful of the petty vices. To miners and engineers in all parts of the world, tobacco has been the one sure solace. It soothes in loneliness, compensates for disappointment, and is an outlet for spleen. Who can deny the calming influence of tobacco as a factor in cool reasoning, keen analysis, far-seeing judgment, and deliberate action? Who can but admit that it helps to that frame of mind, that spirit of peace and contentment, that is so eminently conducive to clear thinking?

Mining engineers are accustomed to weigh the pros and cons of any matter with a view to ascertaining the factors affecting the attainment of the highest personal efficiency and the greatest national credit and progress. Tobacco smoking never has formed and never will form an obstacle to the achievement of either, and public opinion will prevent consummation of the present inopportune proposal for its compulsory abolition.

BY THE WAY

The West Coast of Africa presents unique and interesting features even to the much-traveled miner. Among them not the least interesting is the Coast negro, with his typical patois, which sounds to the newcomer like a cross between Jamaica negro English and Chinese pidgin English, to which he must give the closest attention if it is to be understood. Even then he hears words that are evidently of Spanish, Portuguese, French, or German origin, or words that have no meaning at all to the stranger. The voyage from Liverpool to Ashanti is rather pleasant, is to be made in comfortable boats, and, with several stops en route, monotony is broken from time to time. But an unpleasant feature, to one on his first voyage, is the reputation of the country, which grows worse as it is approached. The purser accidentally lets fall a word about the yellow fever at Acra, or the death of the company agent at Axim; several of the passengers are going out to replace men who "will never come home"; there is considerable discussion of the best methods of avoiding some of the malignant fevers. A mysterious bundle, long and white, is dropped off the stern of the steamer by four sailors early in the morning when you are just looking out to see what the ocean looks like at dawn. By the time one reaches his port of debarkation, if inclined to be at all nervous, he is not sleeping well and is figuring on the departure of the return steamer.

The mine boss and the master mechanic were sitting in the office discussing the extension of a new pipe line, runs a story in the *Queensland Government Mining Journal*, when two miners came in very much excited, disputing the ownership of a certain car which had come up the day previous without a check. Each presented his case to the boss, claiming that he was short one car and that the car was his. The mine boss found from the weighmaster that only one car had come up without a check, and as both men had places where they pushed their cars by hand to a parting, he knew he would be unable to identify the particular car in question. He therefore had no evidence whatever to help find the rightful owner, but in spite of this there was no hesitation whatever in his manner as he turned briskly to the two men. "Now, I'll tell you what I'll do with you fellows. I don't know which of you owns that car, so the fairest thing I can do is to give each of you credit for half of it. Is that agreeable to you?" turning to one of the miners. "Yes, that's fair enough," the man replied, after thinking it over a moment. "And how about you?" said the boss to the other. "It doesn't suit me at all. That car belongs to me, and I want it," the second miner replied. "Well, you can go," said the boss. "I'll let you know after a while what I will do about it." After the man had left, the mine boss spoke up to the first miner. "You've got your nerve to try to put one over me like that. I happen to know that you didn't have your place ready to load yesterday until 4 o'clock, and then it was too late to get cars. You heard that we had a car without a check and thought you'd work me for it. I know your kind, and if you ever try to put over any more funny business like that on me I'll fix your clock right. Do you get me?" The man protested a minute and then walked sheepishly out of the office. "I'll hand it to you," said the master mechanic after the man had gone. "You handled that pretty slick. The fellow was a rummy, however, to try it when you knew about his having nothing to load." "But I didn't know. That was pure bluff to make him own up. Any man as willing as he was to split was pretty good evidence that he was getting something for nothing, and I figured if I went at him strong enough he would back down. It is part of the system." Well, I'll say one thing for your system: it's sure a good one." "It ought to be," replied the mine boss. "It's about 3000 years old. Old Solomon was the first man on record to try it, and I guess he was as smart as they come."

Although occupying the western portion of Utah territory, the laws under which the people of the Comstock range were at this time living were of their own making, narrated Dan De Quille in "The Big Bonanza." In August, 1859, two thieves were sentenced by a local jury to have their left ears cut off. Jim Sturtevant, an old resident of Washoe Valley, was appointed executioner. He drew out a big knife, ran his thumb across the blade, and, not finding the edge exactly to his mind, gave it a few rakes across a rock. He then walked up to Reise, one of the prisoners, and taking a firm hold on the upper part of the organ designated by the jury, shaved it off, close up, at a single slash.

As he approached Ruspas, the other prisoner, the face of that gentleman was observed to wear a cunning smile, and he seemed to be much amused at something. The executioner, however, meant business, and, tossing Reise's ear over to the jury, he went after that of Ruspas, whose eyes were following every motion made, and whose face wore the expression of that of a man about to say or do a good thing. Sturtevant pulled aside the fellow's hair, which he wore hanging down about his shoulders, and lo! there was no left ear, it having been parted with on a previous and similar occasion.

Here was a fix for the executioner! His instructions were to cut off the fellow's left ear, and there was no left ear on which to operate. The prisoner looked him in the face and laughed aloud, for the joke was so good that he could no longer restrain himself.

Sturtevant appealed to the jury for instructions, and they, enjoying the scene not a little, and being in good humor, said that they would reconsider the sentence, and that, rather than cause any one to be disappointed, the executioner might take off the prisoner's right ear, if he had one.

The smile faded out of the countenance of Ruspas as he felt Sturtevant's finger securing a firm hold on the top of his right ear. An instant after, Sturtevant gave a vigorous slash, and then tossed the ear over to the jury, saying, as he did so, that they now had a pair of ears that were "rights and lefts," and so properly mated.

This little ceremony over, the pair of thieves were directed to take the road leading over the Sierras to lines on which the franchises have been forfeited and the beautiful "Golden State."

Personals

J. B. Tyrrell made a visit to Timmins, Ontario, on April 2.

E. R. Reets has been elected a director of the A. S. & R. Co.

Henry M. Howe is to sail for Europe in April for a stay of about three months.

Perry Harrison, of Salt Lake City, is in the Lordsburg district making examinations.

Dorsey A. Lyon, supervisor of stations for the Bureau of Mines, is on an extended Western trip of inspection.

John H. McLean, general manager of the Oliver Iron Mining Co., is spending a short vacation in California.

F. G. Stevens, Toronto, has returned from a three months' visit to Mexico, where he was examining properties.

A. W. Allen, of the editorial staff of the "Journal," is visiting the Pittsburgh experiment station of the Bureau of Mines.

Claude Gordon, of Ashland, Wis., has been appointed chief clerk of the mining experiment station at Fairbanks, Alaska.

Victor Ziegler, professor of geology of the Colorado School of Mines, will resign to engage in professional consulting work.

J. S. Lutes, general manager of the Tod-Stambaugh mining interests in Minnesota, has returned from an extended trip in Texas.

R. C. Wallace, commissioner of northern Manitoba, who was recently taken seriously ill at Toronto, has recovered and returned to The Pas.

Harry J. Wolf made an examination of the properties of the Nacozari Consolidated Copper Mining Co. near Pilares, Sonora, Mexico, recently.

John T. Glidden and **C. Carleton Semple** are examining copper properties in the Yauricocha district and coal mines at Jautenhuasi, in **Peru.**

Edwin R. Eaton, mining engineer of Crown Point, N. Y., has taken charge of the Tate manganese property near Marion, Va., for the Lozier Coal Co.

K. Loggers, an engineer on the staff of the Lindeteves-Stockvis Exporting Co. of Amsterdam, Holland, visited Salt Lake during the latter part of March.

J. Krutschnitt, Jr., manager of the exploration department for the southwest for A. S. & R. Co., has been in the Lordsburg district recently making examinations.

E. H. Clausen has been discharged as captain of engineers in the U. S. Army, and is now associated with the Mine and Smelter Supply Co. in the New York office.

John Hays Hammond and **Willian Boyce Thompson** were the only speakers at the 12th anuual dinner of the Rocky Mountain Club on Apr. 8 at the Waldorf Astoria, New York.

Gelasio Caetani, of the firm of Burch, Caetani & Hershey, consulting engineers, San Francisco, will discontinue professional work because of conditions arising from the late war.

Frederick Burbidge, of Wallace, Idaho, manager of the Federal Mining and Smelting Co., is in Oklahoma in connection with the zinc-mining operations of the company in that state.

Stuart B. Marshall, consulting engineer and metallurgist, of Roanoke, Va., has established his headquarters now at Chevy Chase, Md.; telephone Washington, D. C., "Cleveland," 1672. He also retains his Roanoke address.

J. B. Foster, president, and **James P. Porteus,** superintendent, of the Bonney mine, have returned to the Lordsburg district from a visit East upon matters pertaining to the further development and equipment of that property.

John F. Coats, mining engineer of Vancouver, B. C., representing English mining interests, made a preliminary inspection of several gold properties near Placerville, Calif., some time ago and returned recently to make a further examination.

C. L. Colburn has returned from service with the Corps of Engineers, in which he held a commission as captain, and has resumed his former work as assistant metal-mining engineer for the Bureau of Mines, stationed in Washington.

Maj. Charles V. Bacon, who was engaged during the war on an investigation relating to liquid fire and war gases, has been made Chief of the Research Section of the Engineering and Standardization branch, P. S. & T. division of the General Staff.

William J. Hall, assistant manager of the Federal Mining and Smelting Co., of Wallace, Idaho, has been appointed Commissioner of Public Works by Governor Davis. This is one of the positions created by the last session of the Legislature.

William W. Elmer, who has been directing the installation of a high-head hydro-electric plant and compressor equipment for Gibson Mining Co., Ltd., will complete this work soon, but will continue his connection with that company as consulting engineer.

Carl Brewer, assistant chief mining engineer for the Cleveland-Cliffs Iron Mining Co., at Ishpeming, Mich., has been transferred to Hibbing, Minn., where he will have charge of the Bourne mine for this company. **R. J. Chenneour** succeeds Mr. Brewer.

Captain Claude Cooper, recently returned from overseas service with the U. S. Army, has been named as superintendent of the Calumet & Hecla electrolytic plant at Hubbell, succeeding **J. C. Bryant.** Captain Cooper formerly was assistant superintendent of the Calumet & Hecla smelting plant.

Lloyd C. White will become a member of the new firm of Burch, Hershey & White, consulting engineers, San Francisco, succeeding **Gelasio Caetani** in the former firm of Burch, Caetani & Hershey and will handle the design, construction, and operation of mills, and ore handling and treatment plants.

Robert J. Anderson has resigned as research metallurgist with the Bureau of Aircraft Production, Detroit, and will join the staff of the Bureau of Mines. He will make special investigation in the metallurgy of aluminum and other non-ferrous metals, at the experiment station at Pittsburgh.

Ralph A. Meyer, formerly engineer in charge of the American Tin and Tungsten Co. at Hill City, S. D., severed his connection with that company on Feb. 26, after the closing of the properties on Feb. 10. Mr. Meyer is now engaged in general consulting work, with headquarters at Deadwood.

C. H. Doolittle, formerly general manager of the Utah Metal and Tunnel Co., of Bingham, and later connected with the Fissures Exploration Co., operating the Pacific mine and mill, in American Fork Canyon, is removing from Salt Lake City to California, where he has purchased a large ranch, in the management of which he will be engaged.

William Beaudry, of Kellogg, Idaho, manager of the Stewart Mining Co. and of the Nabob Consolidated Mining Co., a subsidiary of the Stewart, has resigned, effective Apr. 1. His successor is **Maj. C. C. Griggs,** who up to the beginning of the war was engaged in mining in the Tintic district, Utah, when he entered the military service and was assigned to the Ordnance Department.

John G. Kirchen, identified with several prominent Tonopah properties and president of the Nevada First National Bank of Tonopah, was the victim of a serious accident at the White Caps mill, at Manhattan. Mr. Kirchen stepped on the edge of a trommel when entering a part of the mill, and a bolt caught his left shoe, pulling his foot in between the trommel and the frame, thereby crushing it.

A. C. Callen, of Washington, D. C., special agent for mining and representative of the Federal board for vocational education, recently visited Wallace, Idaho, for the purpose of investigating the work of the class in vocational training of miners that has been established by the Idaho School of Mines in the Morning mine. Mr. Callen is also professor of mining engineering in the University of West Virginia, at Morgantown.

Obituary

C. C. Moore, a mining man of Virginia City, Mont., died on Mar. 13 from pneumonia. Mr. Moore had been interested in mining in Mexico, Alaska, and several districts in the United States. He is survived by his widow.

Theodore W. Osterheld, for many years active in financial circles as a mining expert, particularly in the Mexican field, died on Apr. 3 in New York. Mr. Osterheld was born in 1866 and was graduated as a civil engineer from Columbia University, then going to Mexico, where he spent the greater part of his life in the development of important mines and several railroads. He also became conversant with Central American finances. Upon his return to New York, he was recognized as an authority on financial matters in Mexico and Central America, and in recent years was consulting expert for Iselin & Co. and Lansburgh Brothers, of New York. He is survived by his daughter.

Hon. William John Hanna, of Toronto, president of the Imperial Oil Co., and formerly Provincial Secretary of Ontario, died suddenly on Mar. 20 at Augusta, Ga., where he had gone on account of ill health. He was born in 1862, in Middlesex County, Ontario, and began life as a school teacher. In 1890 he was called to the bar and practiced law in Sarnia, Ont., where he handled much business for the oil interests. He was elected to the Ontario Legislature in 1902, and three years later became Provincial Secretary, retaining that position until 1916. He afterward served as food controller for Canada for seven months, retiring from public life to devote his attention to his business interests. About a year ago he succeeded W. C. Teagle as president of the Imperial Oil Co. He is survived by his widow and two daughters.

H. R. Hancock, for many years prominent in the mining industry of South Australia, died on Jan. 15 at the age of 83 years. Captain Hancock, as he was familiarly known, was born in Devon in 1836 and come to Australia in 1859, being engaged with the Wheal Ellen Copper Mining Co., and three years thereafter went to the Yorke Peninsula, where he assumed control of the Moonta mine. Later Captain Hancock became superintendent for the Wallaroo Mines also, and for 22 years retained complete charge of these properties. He was deeply interested in social, philanthropic and religious institutions and helped to establish the Moonta School of Mines and the Moonta Mines Institute, and for many years he was superintendent of the Moonta Mines Sunday school, besides being connected with various other organizations. Captain Hancock was the inventor of the Hancock rock drill and the Hancock jig, which are well known.

Societies

Engineers' Club of Northern Minnesota held the regular meeting on Mar. 29 in Virginia, Minn. The program was on the subject of vocational **education.**

Mining and Metallurgical Society of America will hold a special meeting on May 1, at 5 p.m., at the Columbia University Club, New York, for further consideration of the proposed amendments to the bylaws.

American Society of Civil Engineers held a regular business meeting at which Col. Dabney H. Maury, U. S. A., advisory engineer on water supply, construction division, war department, addressed the members on "Water Supply at Camps and Cantonments and All Other Government Enterprises."

American Society for Testing Materials will hold the 22nd annual meeting at Atlantic City on June 24-27, with headquarters at the Hotel Traymore. A topical discussion on "Magnetic Analysis" will be held. A number of committees have announced their intention of recommending proposed new standards for publication as tentative, and several important investigations being conducted will be reported on. The Executive Committee has accepted on behalf of the society an invitation to become a member of Engineering Council.

National Safety Council, Chicago, at a meeting held by the executive committee on Feb. 24, unanimously elected as general manager C. W. Price, who has been the council's field secretary for a number of years and is a pioneer in safety work, having spent 12 years with the International Harvester Co., the last four years of which he was in complete charge of all safety work for all the plants. He was assistant to the Wisconsin Industrial Commission, and director of the safety survey made by the U. S. Employment Compensation Commission, which embraced all arsenals and navy yards. The retiring general manager, W. H. Cameron, will become manager of industrial relations for the Eastman Kodak Company.

American Society of Mechanical Engineers, New York Section, and the Society of Automotive Engineers, Metropolitan Section, held a symposium on the heavy-oil engine on the evening of Apr. 9, at the Automobile Club of America. The program was arranged to give to the membership of the two societies the most complete and comprehensive presentation of

the heavy-oil engine that has yet been made. The topics discussed were: Adapting fuel to the engine vs. adapting the engine to the fuel, and the scope and limitations of present designs of heavy-oil engine. The application to the following types was also discussed: Carburetor type heavy-oil engines, engines with hot-metal ignition, and Diesel-type engines. Papers were presented by the following: E. W. Dean, U. S. Bureau of Mines; J. H. Hunt, experimental engineer, Dayton Engineering Laboratories Co.; A. H. Goldingham, De La Vergne Machine Co.; T. O. Lisle, editor, "Motorship," and others. Dr. Charles E. Lucke, Dean of the School of Mechanical Engineering, Columbia University, and late Director of the U. S. Naval Gas Engine School, presided.

Industrial News

Aspromet Company announces name of company has been changed to the H. H. Robertson Company.

The Dust Recovering and Conveying Co., Cleveland, Ohio, has removed the main office to the factory at 1710-14 Woodland ave., Cleveland.

Edison Storage Battery Co., Orange, N. J., has a new price list effective Mar. 1, reducing the price of Types A, B, and G Edison cells approximately 16 per cent.

Chicago Pneumatic Tool Co. announces the discontinuance of its office at Wichita, Kan., and transfer of the company's stock to Eldorado, Kan., where an office and warehouse have been established.

Charles F. Ames & Co., 90 West St., New York, have been appointed to act as the New York sales department of the Platt Iron Works, of Dayton, Ohio, manufacturers of pumping and power-plant equipment.

Stephens-Adamson Manufacturing Co., of Aurora, Ill., has recently established a new sales office in Cincinnati, Ohio, to give personal engineering attention to this particular territory. John G. Stewart, who has been associated with the company for 15 years, has been appointed district manager.

Carlisle Mason, Incorporated, consulting engineers, No. 207 Broadway, N. Y., and 81 Rue St. Lazare, Paris, announce the return from France of Carlisle Mason, president, who has resigned his commission as a major in the U. S. Army and will resume the practice of general consulting engineering with the firm.

Walter A. Zelnicker Supply Co., St. Louis, announces the return of H. J. Elson, who has served during the war as Lieutenant Commander, U. S. N., to his former position as secretary-treasurer of the company. He will assume charge of the internal management and manufacturing operations.

Advance Machinery and Supply Co., Denver, Colo., announces the appointment of S. A. Koenig, until recently a first lieutenant in the Coast Artillery Corps, as sales engineer. Mr. Koenig was formerly employed in the experimental department of the General Electric Co., at Schenectady, N. Y.

The Ideal Engine Company of Lansing, Mich., manufacturer of Ideal power equipment, which includes hoists and pumping outfits for general contracting, road building and excavating work, was recently fortunate in adding H. H. Lucas to the company's sales force. Mr. Lucas, before joining the U. S. Navy, where he became an ensign, was with the Lansing company.

Epping-Carpenter Pump Co., Pittsburgh, announces the appointment of F. S. Healey as sales manager, to be in addition to his present duties as chief engineer, vice R. F. Woods, who is now situated in New York as Eastern sales manager. Albert A. Schenck has been appointed assistant sales manager and Paul D. Goodman, formerly of McClary Jemison Machinery Co., of Birmingham, Ala., has been added to the sales personnel.

Powdered Coal Engineering and Equipment Co., of Chicago, announces the appointment of A. U. Wetherbee, who recently received his discharge as captain in the chemical warfare branch of the service, to the position of chief mechanical engineer. The appointment of C. C. Wallace, formerly manager of the loading of munitions section of the Stenotype company, Indianapolis, to be director of development and service, is also announced.

Becker & Smyth, Chicago, contracting engineers, and sales agents for Layne & Bowler Co., have recently organized under that title. C. R. Smyth has been special engineer for some time with the Layne & Bowler Corporation, and previously was connected with the York Engineering and Supply Co., of Houston, Tex.; sales engineer for Bush, Sulz & Bros. and for the Diesel Engine Co. W. E. Becker, president, has been with the York Engineering and Supply Co. for the last 12 years.

Electric Furnace Association is being organized to promote the use of electric-furnace products. A meeting was called by Acheson Smith, vice-president and general manager of the Acheson Graphite Co., at Niagara Falls, on Mar. 21 and 22. Representatives of a large number of manufacturers were present, and officers and directors of a permanent organization were elected. Committees on publicity, data and fields were appointed. Acheson Smith was elected president and C. C. Schluederberg, of the Westinghouse Electric Manufacturing Co., Pittsburgh, was elected treasurer.

American Manufacturers' Export Association has been informed of the appointment of George P. Toby, as Executive Secretary of the American Chamber of Commerce in London, and he will sail for his new post on May 12. Mr. Toby will attend the coming meetings of the National Foreign Trade Council and the U. S. Chamber of Commerce prior to date of sailing, for the purpose of conferring with American merchants as to the service which the American Chamber in London can render them. He will also confer with the editors of McGraw-Hill publications to obtain increased coöperation in serving American manufacturers.

Sullivan Machinery Co., Chicago, has published the March issue of the company's magazine, "Mine and Quarry," which directs attention to the establishment of a Foreign Trade Department and the desire of the company for extension of its export business. In this connection the following branches have been established with the company's own organization: At London, Salisbury House; at Paris, 18 Avenue Parmentier; at Santiago, Chile, Casilla No. 27; and at Sydney, N. S. W., Australasia, Chambers, Martin Place. Engineering agencies of established standing handle Sullivan products in Christiania, Amsterdam, Gijon, Spain; Turin, Italy; Algiers, Tunis, Johannesburg and Durban, Shanghai and Tokyo, Lima and Buenos Ayres.

The Railway and Power Equipment Co., Woolworth Bldg., New York, has received an inquiry from Belgium for $200,000 worth of machine tools, including lathes, planers, shapers, turning and boring machines, slotters, radial drills, steam hammers, punches and shears, machinery for manufacturing springs and four 16-ton traveling cranes. The company also has the following export inquiries: New steel rails for a French colony to the amount of 120,000 tons; five tons of portable track for France; electric power and lighting machinery for Japan; slotters, hammers, presses, cranes and locomotives for Bombay, India; railway, mining, sugar plantation and factory equipment for Panama; air compressors for Chile; derricks and electrical machinery for Hong Kong, China; contractors' supplies, machinery and equipment for France; machine tools and hammers for England; railroad equipment for Spain; machinery and tools for Antofagasta, Chile, S. A.; a large quantity of electric motors for Bombay, India; machinery and tools for Brazil; railway equipment and machinery for Argentina; three new steam locomotives for Japan and 40 pairs of steel car trucks for electric railways for Italy. This company also reports active inquiries from buyers throughout the United States, indicating that considerable buying is being done and that plans are maturing for more in the near future.

Trade Catalogs

Gasoline Locomotives. J. D. Fate Co., Plymouth, Ohio. Catalog No. 4, Bulletin H.; 8½ x 11; 16 pp.; illustrated. Describes the use of Plymouth gasoline locomotives in general mining work, on the surface and underground, at properties of well-known mining companies.

Concentrating Tables. The Deister Concentrator Co. Fort Wayne, Ind. Bulletin No. 3; 6 x 9; 21 pp.; illustrated. Descriptive of Deister-Overstrom diagonal-deck types of ore concentrators, outlining the theory of concentration and describing the materials and construction of these tables. Sand, slime, and rougher tables are also described.

Hoists. United Iron Works Co., Kansas City, Mo. Catalog H-19; 10 x 7; 75 pp.; illustrated. Descriptive of "United" built hoists, including belt, steam and electric-driven and horse- and hand-operated types. Specifications covering weight, rope pull and speed, power required and types of clutch and brake, are given in each case The last eight pages are devoted to "Handy Rules on Gearing," which are particularly informative, and tables of data on wire ropes and required horsepower for lifting different loads.

Perforated Metals. Hendrick Manufacturing Co., 30 Church St., New York; 6 x 9½; 127 pp.; illustrated. Describes the uses of perforated metals of all kinds in a large number of industries, devoting the majority of pages to excellent illustrations and tables on all gages of standard perforated screen plates. Special screens for particular purposes are also described, as are straight and conical revolving screens, Other pages are devoted to elevator buckets, conveyor troughs, stacks, hoppers, and loading chutes. Useful tables are included in the back pages. On account of the nature and value of the data contained, the company requests that the catalog be regarded as a work of reference.

Insulators, Overhead Materials, Rail Bonds, Car Equipment Specialties. The Ohio Brass Co., Mansfield, Ohio. Catalog No. 17; 6 x 9; 671 pp.; thumb-indexed. illustrated. A complete catalog of high-tension porcelain insulators, suspension insulator hardware, bus-bar installation, porcelain wall or roof insulators up to 150,000 v., arc-lamp hangers and anchor or guy rods. Under the overhead-line material section a complete description is given of strain insulators, rigid and flexible pole brackets, mine hangers of various types, I-beam clamps and insulators for mine-feeder wires. The catenary materials section contains formulæ and numerous line sketches for all types of the catenary system of line construction for electric traction, of much value to the engineer. Tables are included giving materials required per mile of tangent. Other sections are devoted to rail bonds and tools; third-rail insulators and to car equipment. The last section contains a number of tables and formula for copper wire, steel strand and aluminum wire, giving dimensions, weight, and resistance.

New Patents

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each.

Alloy of Aluminum, Zinc and Copper. David J. Hauss, Aurora, Ind.; Barbara Hauss, administratrix of said David J. Hauss, deceased, assignor to F. W. Galbraith. (U. S. No. 1,293,426. Feb. 4, 1919.)

Antifriction Bearing. Melvin A. Yeakley, Canton, Ohio. (U. S. No. 1,293,605; Feb. 4, 1919.)

Drill Tool. George H. Gilman, Claremont, N. H., assignor, by mesne assignments, to Sullivan Machinery Co., Boston, Mass. (U. S. No. 1,293,081; Feb. 4, 1919.)

Furnace, Electrical Metallurgical. William E. Moore, Pittsburgh, Penn. (U. S. No. 1,293,164; Feb. 4, 1919.)

Manganese — Polymerized Manganese-Dioxide Depolarizer. Alfred A. Wells, Montclair, N. J., assignor, by mesne assignments, to National Carbon Co., Inc., Cleveland, Ohio. (U. S. No. 1,293,272; Feb. 4, 1919.)

Metal-Casting Apparatus. Edward L. Wolff, Waterbury, Conn., assignor to Scovill Manufacturing Co., Waterbury, Conn. (U. S. No. 1,294,742; Feb. 18, 1919.)

Metallic Oxides, Process of Treating. James W. Moffat, Toronto, Ontario, Canada. (U. S. No. 1,294,514; Feb. 18, 1919.)

Mine Shafts, Steel Framing for. Ora D. McClure, Ishpeming, Mich. (U. S. No. 1,294,814; Feb. 18, 1919.)

Rock Drill. William A. Smith, Denver, Colo., assignor to the Denver Rock Drill Manufacturing Co., Denver, Colo. (U. S. No. 1,293,225; Feb. 4, 1919.)

Sintering Ores, Process of. Adelbert H. Richards, Salt Lake City, Utah, assignor to American Smelting and Refining Co. (U. S. No. 1,292,059; Jan. 21, 1919.)

Sulphuric Acid, Process of and Apparatus for Concentrating. Henry G. Klink, Moundsville, W. Va. (U. S. No. 1,276,377; Aug. 20, 1918.)

Tungsten, Process of Extracting Tungsten and Similar Metals From Their Ores. David John Giles and James Earl Giles, McKeesport, Penn. (U. S. No. 1,293,402-3-4; Feb. 4, 1918.)

Zinc Ore, Method of Treating. David B. Jones, Chicago, Ill. (U. S. No. 1,292,-330; Jan. 21, 1919.)

Editorial Correspondence

SAN FRANCISCO—Apr. 5

United Mine Workers of America will not participate in any general strike on July 4, as planned by the convention held in Chicago last January in behalf of Thomas Mooney, the "United Mine Workers' Journal" announces, in its April issue. This was definitely decided by the international executive board at its meeting in Indianapolis on Mar. 25, by the adoption of a report of the committee on the Mooney case.

Mother Lode Mines are discussed by Thorald F. Field, a mining engineer, and T. C. Gorrie, general manager of the Old Eureka mine, in a report on that mine dated Feb. 26, 1919, which was the result of an investigation to determine what level should be opened next in the property. The report states: "The general experience of different mines on the Mother Lode throws no definite light on this property. At the horizon where the ore is lean for one, that same horizon in another mine may be particularly good. For instance, the Kennedy mine had a lean zone between 1800 and 2300 levels, whereas this zone was good in the South Eureka. It seems that the Kennedy had good ore from the grass roots almost down to the 600; from the 600 to the 800 it was lean; from 800 to 1200 it improved gradually; from the 1200 to 1600 it was good; from 1600 to 1800 it became poorer, and from the 1800 to the 2300 it was very lean. If the 2300 level had been driven 10 feet deeper, it would have disclosed a lot of good ore. From a little below the 2300 level down to the present bottom of the mine, which is about 4000 ft. deep, the ore has been good. As far as indications in the Old Eureka mine are concerned, it is impossible to say which level should be opened next, except that on general principles the vein should be developed at least every 500 or 600 ft. Otherwise some valuable ore might be missed entirely. At the present writing, the 2100 level is the deepest working. It does not follow from this, however, that the 2600 level should be opened before a 3200 level, for instance. In fact, it seems advisable to open a deeper one first, on account of the recent find at the Central Eureka." It is stated further that the Central Eureka has made a valuable find, and it is probable that this ore will extend into the Old Eureka, at depth. In the latter, all small streaks of ore in the upper workings are being sampled.

BUTTE, MONT.—Apr. 7

Curtailment in Copper Production by the Anaconda Copper Mining Co. was further increased this week by the closing of the Silver Bow, West Gray Rock, and the Butte-Alex Scott shaft of the West Colusa mine. The closing of these properties throws out of work about 450 men and decreases the output of copper ore by approximately 600 tons a day.

Accidents in the Anaconda Mines, according to the official report of the company for the month of January, as to mine conditions, amounted to 32, of which four were fatal. The accidents were in 16 different mines, and, though a few were due to falls of ground, the greater number resulted from carelessness on the part of the men.

DENVER, COLO.—Apr. 5

National Association of Potash Producers was organized when representatives of 21 potash-producing companies met here on Apr. 3, and discussed plans for making the United States independent of Germany in this industry. It was said that 95% of the potash industry in this country was represented. Various speakers asserted that if protection from German competition was furnished for two years' time, the American industry could produce a surplus and make America independent of the foreign supply.

Snowslides seem to be accomplishing their customary amount of damage to mining property. In San Juan County, between Eureka and the Midway mill of the Sunnyside Mining and Milling Co., in Eureka Gulch, a new slide destroyed eight tramway towers. The cables were torn down and the bull wheel of the tramway was displaced, causing a shutdown of the new mill. The towers were from 40 to 60 ft. high, and their reconstruction at this season of the year is difficult. The work of repairing the damage is under way. Near Telluride, in San Miguel County, the Hanging Rock slide, on the west side of Ajax Peak, struck the Smuggler-Union tramway tension station and the electric power line which delivers power to the Bullion tunnel. Both tramway and power line were out of operation until necessary repairs could be made. A small slide ran off the cliffs above the Stillwell tunnel of the Liberty Bell Gold Mining Co. and damaged part of the boarding house, and covered some of the men who were in the building at the time. A rescue party did its usual good work, and no permanent injuries are recorded. A slide at Windy Point, on the Rio Grande Southern Ry., covered the track for a distance of 300 ft., and delayed traffic for about 24 hours. Several large slides ran near Ophir Loop, and covered the railroad tracks near that point. These were removed by rotary snowplows. Numerous slides occurred in other parts of the district, but did no material damage, although in some cases inconvenience was caused owing to the blocking of wagon roads.

SALT LAKE CITY, UTAH—Apr. 3

Tax Assessments on mining properties according to the law just passed by the Utah Legislature, will be made by the State Board of Equalization, whose scope has been considerably extended. For example, the rating of mills and other mining property not situated at the mines as a part of the mining properties with which they are connected places the matter of their assessment—hitherto in the hands of the county assessors for the counties in which they are situated—under the jurisdiction of the State Board of Equalization. This is the case, also, with mine dumps and accumulated tailings. In regard to non-metalliferous mines—coal mines and properties carrying asphalt, gypsum, salt, building and other stone, sulphur, alunite and hydrocarbons—these are to be assessed by the board according to their actual cash valuation. For the year 1919—the law requiring all mining property to be assessed by the first Monday in May—tentative assessment will be made from the work of Prof. W. G. Peterson, of the State Agricultural College. During the coming summer, Professor Peterson, with a surveying party of three, will be occupied in the field gathering data upon which to base future assessments. The data will include the probable mineral content of the land and the probable cost of extraction.

DULUTH, MINN.—Apr. 6

The International Harvester Co., at its Hawkins mine, at Nashwauk, has recently put into effect a welfare plan which is known as the company's "works council plan." Under the operation of the plan each department elects a member to the council and these meet with a representative of the company. This council is the final court of appeal in all matters which come up pertaining to the employees of the mine.

The Tonnage Tax Issue in Minnesota was laid away until 1921 at least when it failed to pass the House by a narrow margin of two votes. The tonnage tax has appeared before every Minnesota Legislature except one since 1907, and has always been the center of a severe fight. None of the contests has been more strenuously fought than the one just ended, and it is noteworthy that none has been more free from hard feeling and recrimination.

Maintenance of Iron-Ore Prices and the present wage scale as decided by the recent iron and steel conference at Washington has greatly clarified the mining situation on the Minnesota ranges. The smaller independents and employees generally will benefit particularly, and though present indications point to a production considerably smaller than last year's, all elements of the community face the coming season in a more hopeful spirit.

WALLACE, IDAHO—Apr. 7

The Coeur d'Alene District shows a decided tendency toward a revival. This, however, applies to development companies rather than to the large producing mines, some of which are closed entirely, and those still running are doing so under adverse conditions, owing to the absence of a stable market for lead and zinc. But development companies, those that depend upon assessment of stockholders to carry on their work, are beginning operations to an extent that at least lends a more cheerful aspect to the mining situation. Most of these companies were forced to suspend during the war, on account of the excessive costs and shortage of men, and also for the purpose of directing their energies in lines that would contribute to the support of the government in winning the war. With the coming of peace and the prospect of a long period of prosperity for the mining industry, these companies are eager to begin the work of developing new mines, but have been delayed in doing so partly on account of the heavy snow in the mountains and partly because of the continued high prices after the armistice was signed. These conditions have now undergone a change. There has been a substantial reduction in wages and a cut of $2 per hundred in the price of powder, following a similar cut last December, and further reduction in the price of explosives is reasonably to be expected. Under these circumstances some companies have felt justified in resuming operations during the last few weeks, and others are planning to follow.

HOUGHTON, MICH.—Apr. 3

The Copper Situation presents several phases worthy of present consideration, in regard to production. Notwithstanding the fact that stocks of copper are accumulating and have been accumulating on the smeltery docks of this district since last December, and that sales have been few and far between and practically no deliveries have been made excepting on old orders, hurry-up orders for immediate shipment of copper came in this week. One shipment called for express service. Carload lots by fast freight went out Friday and more cars have been ordered up for filling. In view of the fact that water shipments can reasonably be expected to be made within a few weeks, and the further fact that the difference between rail freight charges and Lake freight is heavier than ever before, rail shipments must indicate one thing—an immediate necessity for copper from the Michigan district. That is the brightest spot in the metal situation.

Little change is to be recorded in the mining situation of the Michigan district. There has been a substantial exodus of workingmen, many going to Detroit, during the last two weeks. The mines continue to curtail output where it can be done. At the Calumet & Hecla, No. 18 has been closed. There is a likelihood that the Point Mills stamp mill, a Calumet & Hecla plant operating under the name of the Lake Milling Co., may be closed. This big plant handled the Hancock Consolidated, Centennial, Allouez, and overflow from Isle Royale. Hancock was the first mine to shut down. Isle Royale output will be confined to the complete capacity of the mill at Houghton. Centennial and Allouez rock will be handled at the smaller mill adjoining the old Tamarack mill. This means the saving of the additional freight charge which the longer haul to the Point Mills plant necessitated.

PHOENIX, ARIZ.—Apr. 3

The State Supreme Court has reinstated on its calendar the suits of the State of Arizona and County of Gila against the International Smelting Co. and Inspiration Consolidated Copper Co., which had been dismissed Mar. 10 for lack of prosecution on the part of the state. The dismissal was the cause of a local political sensation, based upon the indication of negligence on the part of the Attorney General, as the cases involved about $180,000 in excess taxes protested by the companies and also, to a degree, the question whether intangible values, based upon profits, are to be assessed at all. The lower court had decided for the companies, "that they recover from Gila County the amount paid as taxes on a valuation in excess of the full cash value so found. No abstract of record had been filed by the state, and nine months had been allowed to elapse without action or representation in the appellate court. There is denial that the Supreme Court has

any jurisdiction in this class of suit, after settlement in the Superior Court. By permission of the Legislature the State Tax Commission has appointed a special attorney for the case, and the Attorney General also has added an extra member to his staff, particularly for prosecution of this hitherto-neglected case. Both special attorneys are acting independently. It is thought that the cases will not be heard till autumn. In the meantime, there may be a decision affecting the matter from the Circuit Court of Appeals at San Francisco, which is hearing an appeal from Tucson affecting the right of the state to tax outside and intangible values of the Standard Oil Company.

JOPLIN, MO.—Apr. 3

Tri-State Safety and Sanitation Association, the largest mine operators' association of the district at present, may be merged into the American Zinc Institute. Preliminary steps toward this end were taken at a meeting at Picher on Mar. 26, and the final vote on the consolidation or transfer is to be taken Apr. 2. The move followed an appeal from Charles T. Orr, of Webb City, president of the Zinc Institute.

EL PASO, TEX.—Apr. 5

Oil Leases Are Being Drilled over a large area by the Cities Service Company through subsidiaries. It is probable that the total acreage held under lease by this company in Texas is over 1,500,000 acres. About 25,000 acres are in the Ranger Field, which covers parts of various counties, namely, Stevens, Palopinto, Erath, Shackelford, Comanche, Coleman, Callahan, Brown, and Eastland. One well being drilled is on the Allen lease, in Eastland County, which is about a mile east of the well-known Norwood well, which had an initial production of 13,000 bbl. daily. Also, another is being drilled close to the Knowles & Duke well, in Comanche County, one of the big producers of the Ranger field. Drilling is also being done in Coleman and Stephens counties.

SPOKANE, WASH.—Apr. 7

Dividends Paid by Mining Companies of the Northwest for the first quarter of 1919 amounted to $1,484,711, as compared with $2,629,307 paid for the first quarter of 1918. The decrease is largely due to the shut-down of two of the big producers of the Cœur d'Alenes. British Columbia mines paid $695,711, which is only about $77,000 less than was paid by the producers of the province for the first quarter of last year.

TORONTO, ONT.—Apr. 3

The Imperial Oil Co. has formed plans for extensive development of the oil fields of Northern Alberta this season, involving the expenditure of upward of $500,000. Dr. Bosworth, the chief geologist of the company, who will have charge of the work, has already engaged 10 geologists. Five parties at least will start out from Edmonton. The company has already two drilling rigs in Alberta, and four more of a highly powerful type are being brought in from Ohio. Charles E. Taylor, who has been appointed western manager of the development branch of the company, states that two of these rigs are going further north than any drilling rig has yet gone in Canada, and that, before the summer is over, either the theories upon which the company is working will be disproved, or a large territory added to the oil area of North America.

VICTORIA, B. C.—Apr. 3

Consolidated Mining and Smelting Co.'s attitude toward its employees is indicated in a statement made by S. G. Blaylock, assistant general manager, referring to the issue of 10-year convertible gold debenture bonds recently authorized by the directors and endorsed by the shareholders. Mr. Blaylock said: "It has been decided to allow employees of two or more years' standing to subscribe for these bonds without insisting on the stockholding qualification. They may have their payments extended over a period of 10 months. The interest charged on back payments will be at the same rate as is paid on the bonds, namely, 7%." It is further explained that when the list of subscriptions was closed at Toronto on Feb. 3, it was found that shareholders had agreed to take up the entire issue of $3,000,000, but it was decided by the management to accept subscriptions from such employees as desired to take advantage of the offer. Accordingly, the list is now open at Trail for that purpose for a limited time. The bonds are issued at par in denominations of $100, $500, and $1000, and are dated Jan. 1, 1919, carrying 7 per cent.

The Mining News

ARIZONA

Cochise County

DRAGOON COPPER LEASE (Dragoon)—Hoist, tools, and buildings purchased by John Gleeson, of Courtland, and removed there for use on Gleeson lease.

JOHNSON DEVELOPMENT CO. (Johnson)—Reported strike of a good-grade copper ore, in drift on 650 level running southeast from shaft, toward property of Arizona United.

KEYSTONE COPPER (Johnson)—O. K. shaft will start work Apr. 1 after a two-month shutdown, owing to the breakage of machinery.

CALUMET AND ARIZONA (Warren)—Smeltery production of copper for March amounted to 4,602,000 lb., of which 3,736,000 lb. was from company properties.

Pima County

NEW CORNELIA (Ajo)—Production for March was 2,434,000 lb. Cathodes, 1,980,000; smelting ores, 12,000 lb.; cement copper, 442,000 pounds.

SILVER MINING is active in smaller mines; silver shipments to El Paso increasing, especially from Silver Bell, where 25 shippers have been listed. Silver lenses in Twin Buttes, Quijotoa, and Gunsight sections are being explored. South of Tucson, the Empire Zinc Co. reported about to resume on zinc and lead-silver ores.

SULLIVAN (Ajo)—Test run on rich surface gold ores started in small mill at Gunsight.

STRATTON (Tucson)—Option held by W. H. Daily taken by C. N. Wilson, who will settle with E. O. Stratton and terminate litigation. Consists of 26 claims in Catalina mountains.

Yavapai County

DUNDEE-ARIZONA (Jerome)—Upraising from tunnel into surface carbonate blanket at several points. Manager W. E. Defty states that ore developed averages about 7%. Further shaft work suspended till extension haulage tunnel is cut through and backed-up water released. Jerome high school may be placed on Dundee ground. A. J. Smith states that he remains secretary-treasurer for the Mackay-Stephen interests and that C. L. Nabers, reported as resident director, is only agent for the Dundee townsite.

GADSON (Jerome)—Black sulphide in solid vein 12 in. wide being followed in south drift on 1200 level, which is being driven through soft schist, flecked with native copper and chalcopyrite.

JEROME VERDE (Jerome)—Taking ore from Maintop body; shipping resumed of 15% ore to Humboldt smeltery. Ore taken by wagon to Clarkdale to railroad.

UNITED VERDE EXTENSION (Jerome)—Haulage tunnel, 12,384 ft. long, completed after several years' work.

ANVIL (Prescott)—One of first local gold-lode mines taken on option from Samuel Wadsworth by Daniel H. Lockett, of Aspen, Colorado.

PECK (Prescott)—Wagon road from Bradshaw Mountain railroad near Middletown, is open now, after snow blockade of two months, and machinery is going in. Frank W. Giroux, in charge, with W. W. Elliott superintending mill construction, which may be finished about May 1. Old dumps believed to contain 30,000 tons of good silver ore, the contents to be recovered by cyanide. Development work started in mine in new territory.

CALIFORNIA

Amador County

ARGONAUT MINING (Jackson)—Fire which occurred on Mar. 27 originated in 4000 level about 300 ft. from main station. First skipload of night shift men reached 3900 level, smelled smoke, and gave the alarm. Muldoon upcast shaft, used chiefly for ventilation, indirectly connected by crosscuts and winzes with 4000 level was immediately sealed by bulkheading at the top and 3300 level, which required the use of apparatus by workmen, on account of escaping gases. The main Argonaut shaft was bulkheaded at drain tunnel about 200 ft. below collar. This method successfully cut off the fire, and it is expected that it will be completely smothered soon.

San Bernardino County

ATOLIA (Atolia)—Mine and mill shut down, and operations will not be resumed until tungsten market becomes stabilized. Company states it is impossible to compete with cheap labor of China, Japan and Corea, from which countries large importations are brought in free of duty and taxes.

Shasta County

NOBLE ELECTRIC (Heroult)—Was taken over temporarily by the court on Feb. 28, awaiting adjustment of affairs of the company. W. H. French, former vice-president and general manager, appointed receiver. Plant entirely closed.

MOUNTAIN COPPER CO. (Keswick)—Reported that Iron Mountain mine closed down temporarily on order of London directorate. Hornet mine will produce and ship pyrites to various plants on San Francisco Bay for the manufacture of sulphuric acid. Railroad crews and other surface men number about 60. These and the underground crew of the Hornet mine, to a total of 150 out of 450 men formerly employed, will be retained. Soldiers and married men formerly employed at the Iron Mountain will be transferred to the Hornet.

COLORADO

Boulder County

COLORADO PITCHBLEND CO. (Jamestown)—Purchased Wano mines and mills at Jamestown, thereby obtaining control of practically all of the fluorspar deposits of the neighborhood. Plan to remodel mill at once for concentration of fluorspar, and enlargement of plant to treat 300 tons a day is under consideration. Golden Age mill increased from 60 to 100 tons a day.

Clear Creek County

EDGAR (Idaho Springs)—Will be developed under lease above Big Five tunnel level by Al Freedman, who plans to advance drift on this level several hundred feet.

LITTLE MATTIE (Idaho Springs)—Milling equipment being installed, including two flotation machines. Lessees plan to repair old workings and resume development.

San Miguel County

CARBONERO (Ophir)—Lessees operating in second level opened good ore carrying gold, silver and lead. The ore is being packed on mules to railroad, and shipped crude to Durango smeltery.

WESTERN COLORADO POWER CO. (Telluride)—Supplies bulk of hydroëlectric power for San Juan district, now suffering from water shortage owing to delay in melting of snow in upper basins above its storage reservoirs. Has been compelled to reduce amount of power delivered to large operators by about 50%. This condition will obtain probably for about 30 days. Smuggler-Union, Tomboy, Liberty Bell, and Black Bear will be compelled to reduce production. Smuggler-Union has own electric power plant, with almost sufficient capacity for its mine and mill. Other companies will temporarily reduce their working forces until relief is obtained.

San Juan County

SHIPMENTS FROM SILVERTON during February as follows: Sunnyside, 23 cars; Iowa-Tiger, 14; Mayflower Leasing Co., 6; Dives Leasing Co., 1; miscellaneous, 17; total, 61 cars.

LACKAWANNA (Silverton)—Compressor plant and blacksmith shop recently destroyed by fire caused by overheated stove. Loss estimated at $7000, not covered by insurance. Plans to repair damage when snow conditions permit. Underground development will continue.

KANSAS

Joplin District

LUCKY JEW MINING (Commerce, Okla.)—Situated at Westville, Kan. Will start to erect concentrating plant of 300-ton capacity per shift on May 1. Ed. Depee, superintendent.

BENDELARI (Joplin)—Preparing to install four electric pumps in shaft now going down on lease northwest of Treece, Kan. One 8-in. electric pump now in use insufficient. Situated just north of Broomcorn mine, where pumping has been under way for two years.

BIG ELK MINING (Treece)—Will move and erect Doris mill from Quapaw soon. Expect to purchase gas engine, rolls, rock drills, and tables.

MICHIGAN

Copper District

MASS CONSOLIDATED (Houghton)—Retimbering B shaft from top to bottom. Operations confined to output from other working shaft. Physical conditions unchanged in newer openings. Operations are costing approximately $40,000 a month, the bulk of which is for labor. Copper output curtailed 14 per cent.

MICHIGAN (Houghton)—During January shipped 5630 tons of rock to the mill. Smelter returns showed 28 lb. fine copper per ton of rock stamped. During February, shipped 3977 tons of rock, showing 33 lb. on the average secured.

MINNESOTA

Mesabi Range

SELLERS (Hibbing)—Stripping operations encountering caves of old underground workings. Model 90 shovel being used for this work, in addition to big shovel which has been operating all winter.

WEBB (Hibbing)—Winston-Dear Co. resuming work of stripping pit for Shenango Furnace Co. Small shovel removing taconite at north end.

PILOT (Mountain Iron)—Preparing for complete electrification. Bulk of stripping completed and one shovel soon to start on final clean-up.

MISSOURI

Joplin District

CHARLES WINDBIGLER (Joplin)—Situated at Waco. Moving and erecting old Jasper County mill from Prosperity. Capacity of new plant to be 250 tons per shift. Will purchase pumps, rock drills, belting, and hoist. Work to be completed May 1. Charles Windbigler, owner and manager. W. O. Cardin, contractor.

ORANGE (Joplin)—Preparing to install flotation plant and Dorr equipment at sheet ground mine in Carterville. One of two sheet-ground mines of district that has survived present conditions. Dirt gives recovery of only 2½ to 3%, but mining is done in open pit. F. C. Wallower, of Joplin, is manager and owner.

FREEHOLD OIL AND GAS CO. (Waco)—Moving and erecting second-hand mill at No. 3 shaft of estimated capacity of 200 tons per shift. W. S. Marquiss, manager.

CARLAT MINING (Webb City)—Remodelling and enlarging plant to 200-ton capacity per shift. Expect to purchase boilers, gas engine, rolls and belting. C. Cornett, manager.

MONTANA

Broadwater County

IRON MASK (Hassel)—New crosscut tunnel started to tap vein at depth of 700 ft. Silver, lead and manganese ore from 350-ft. shaft and drifts.

KEATING MINE (Radersburg)—New roll mill for treating large tonnage of gold-bearing ore on dump. Electrical power. Not yet determined whether concentrates will be shipped to smeltery, or leaching process used on ground.

Deer Lodge County

THE WASHOE SMELTERY at Anaconda is operating with about 50% of its force, notwithstanding that the company mines in this district are not hoisting 60% of normal capacity. The smeltery is also handling some custom ores and treating a considerable quantity of flue dust from stack.

Lewis and Clark County

HELENA MINE (Helena)—Drifting on silver-lead ore on 400 level and crosscutting to contact vein. Carload ready for shipment.

LEBANON GROUP (Helena)—Four claims sold for $20,000; substantial cash payment; balance due in 12 months. Gold ore.

Silver Bow County

BUTTE MAIN RANGE (Butte)—After 10 days' close-down through labor trobules this property of the Tuolumne company is again shipping ore to Washoe smeltery. Shipments average 150 tons a day.

NORTH BUTTE (Butte)—Still crosscutting from 900 level of Sarsfield claim in eastern section. Some mineral ground gone through, but no indications so far of valuable orebody.

NEVADA

Nye County

VICTORY DIVIDE (Divide)—Owns Jew and Jewess group, adjoining Brougher Divide on west. Starting work. Peter Clark agent.

TONOPAH SHIPMENTS for week ended Mar. 22 were 7190 tons, having gross milling value of $122,230. Shippers were: Tonopah Belmont, 2429 tons, Tonopah Mining, 1050 tons; Tonopah Extension, 1963 tons; West End, 899 tons; Montana, 143 tons; Tonopah Divide, 245 tons; Jim Butler, 152 tons; MacNamara, 210 tons; Midway, 44 tons; North Star, 55 tons.

TONOPAH BELMONT (Tonopah)—Company's statement of operations for seven months ended Dec. 31, 1918, shows $1,023,874 received and receivable for ore, with expenses for mining, milling, and administration of $659,953. A total net income of $384,727 was earned. The net earnings in this period of the Belmont Surf Inlet Mines, Ltd., was $227,992.

NEW MEXICO

Grant County

CO-OPERATIVE MINING (Lordsburg)—Silver property situated at Gold Hill will start erection of flotation mill at estimated cost of $25,000, with 18,000-ton yearly capacity. Equipment will consist of ball mill, crusher, classifier, elevators, float mill, thickener, filter, concentrating table, hoist, compressor, and pump.

85 MINE (Lordsburg)—Shipping 300 tons daily to C. & A. smeltery at Douglas, Ariz. Working mill two shifts daily. Has ordered 1000-hp. boiler and 750-kw. generator. Construction will begin at once.

HIGHTOWER (Lordsburg)—This Gold Hill property, under lease and option from N. Troya by Coöperative Mining Co., now being organized here. Capital, $250,000; $5000 paid in. Shaft, 200 ft.; vein 4 ft. with good grade silver contents; 500 tons estimated on dump. Erection of buildings started and development will begin soon. A $25,000 flotation mill planned. John Walters, who built the 85 and Last Chance mills is interested.

Dona Ana County

DODD-WARREN-CHAPMAN (Tres Hermanas)—Large low-grade lead-silver deposit now under examination. Shaft down 100 ft. in ore on all four sides.

OKLAHOMA

Joplin District

UNDERWRITERS' (Joplin)—Recent drilling proved new deposits on northwest portion of lease near Douthat, Okla., at No. 1 mine, and new shaft will be sunk at once. Good strikes also being made between No. 2 and No. 3 properties at St. Louis, Okla., but this ore can be handled from one of the two mills. F. N. Bendelari is manager.

BECK (Miami)—Has installed five hand jigs on lease northwest of Picher and mining successfully at 203 ft. Erecting 250-ton mill on lease immediately south, using gas engine for mill power and steam for ore hoisting. G. W. Beck, Miami, is manager.

REDSKIN (Miami)—Shut down mill to permit sinking of mill shaft through orebody, which heretofore has been impossible on account heavy water. Expected mill will be down three or four weeks.

KELTNER (Picher)—Sinking third shaft. Butchard flotation plant with Dorr thickener turning out carload of ore weekly. F. W. Evans, Joplin, is manager.

UTAH

Juab County

TINTIC SHIPMENTS during March amounted to 584 cars, or about 29,000 tons, of an estimated value of $1,000,000. Twenty-five shippers. February shipments, 590 cars, and January, five weeks, 668 cars. Dragon Consolidated shipping fluxing and other ores, first on list, followed by Chief Consolidated and Tintic Standard.

EUREKA LILLY (Eureka)—Shaft down about 1300 ft. vertically. Station being cut, and drifting for extension of Tintic Standard ore to be started.

TINTIC STANDARD (Eureka)—During March shipped 100 cars. Trucks used to reach railroad.

Salt Lake County

LOUISE (Alta)—Adjoining South Hecla. Reopened for spring work.

SELLS (Alta)—Development being done and ore accumulated in this work. Car shipped from time to time, roads permitting.

SILVER SHIELD (Bingham)—Tunnel being retimbered and air pipe-line installed to run machine drills.

CARDIFF (Salt Lake)—Work practically suspended until hauling season opening about May 15, when trucks will start down Big Cottonwood Canyon.

Summit County

PARK CITY SHIPMENTS during March, according to preliminary figures, amount to 7566 tons of crude ore, concentrates, and spelter, of estimated value of about $500,000.

SILVER KING CONSOLIDATED (Park City)—Tunnel to develop Thaynes Canyon section in about 9700 ft. Face in softer and more siliceous limestone. Water coming in in greater volume. Lead-silver concentrates from mill being held at present, owing to softness of road from mine to loading station.

Washington County

SILVER REEF CONSOLIDATED (St. George)—Holdings in Silver Reef district, which has record of silver production in early days. Assessment of 1c. per share levied for development. Delinquent May 16.

CANADA

British Columbia

SHIPMENTS OF ORE to Trail smeltery during third week in March aggregated 8208 tons, comparing with 7546 tons in the same period in 1918. The heaviest shipments were made by the Sullivan mine, at Kimberley, and Centre Star, at Rossland.

FLORENCE SILVER (Ainsworth)—Reported operating concentrating mill 20 hours daily and planning for 24 after Apr. 8 to allow production of 600 tons of concentrates monthly, as compared with 170 tons in February and 420 in March. Concentrates average 70% lead and 24 oz. silver per ton. Improvements during last two months believed will increase extraction by at least 10%.

GRANBY (Anyox)—Operations resumed; expect to employ 1200 men soon.

Ontario

ADANAC (Cobalt)—Considering erection of mill.

PRINCESS (Cobalt)—Being reopened by La Rose.

COLLINS (Gowganda)—Is installing steam plant to carry on underground operations.

ELLIOTT KIRKLAND (Kirkland Lake)—Has stopped work.

KIRKLAND LAKE GOLD (Kirkland Lake)—New mill running, and results to date satisfactory.

WRIGHT HARGRAVES (Kirkland Lake)—Sold the remainder of treasury stock. Funds needed to complete mill.

DOME LAKE (Porcupine)—Will start milling again. Results of development on 600 level satisfactory.

QUEBEC

CISCO (Hurricanaw)—Reports promising gold discovery.

MEXICO

GREENE CANANEA (Cananea)—Production for March was 3,200,000 lb. copper; 115,570 oz. silver; 690 oz. gold.

AUSTRALIA

GREAT COBAR copper mines, New South Wales, have been closed, owing to the continuance of the embargo on export of copper, according to a Canadian press dispatch from Reuters, Ltd.

The Market Report

SILVER AND STERLING EXCHANGE

Apr.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Apr.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
3	4.6450	101⅛	48⅞	7	4.6500	101⅛	48⅛
4	4.6800	101⅛	48⅞	8	4.6600	101⅛	48⅛
5	4.6700	101⅛	48⅛	9	4.6500	101⅛	48⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Apr.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
3	15.30 @15.40 15.30	†72⅛	5.17½ @5.22½ 5.15	4.97½ @5.00 4.90	6.25 @6.30 6.25
4	@15.40 15.30	†72⅛	@5.20 5.15	@5.00 4.90	@6.30 6.25
5	@15.40 15¼	†72⅛	@5.20 5.12½	@5.00 4.90	@6.30 6.25
7	@15⅜ 15¼	†72⅛	5.17½	@4.95	@6.30 6.22½
8	@15⅜ 15¼	†72⅛	5.00 4.95	4.75	@6.27½ 6.22½
9	@15⅜	†72⅛	@5.00	4.75	@6.27½

† Government price.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

Apr.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
3	80	79	84	223	221	26	24	37
4	78½	78	84½	226½	224	25	23½	37
5								
7	79	79	84	227	225½	25	23	37
8	78½	78½	84½	226½	225	25	23½	37½
9	77	77	84	227½	225	25	24	37

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

NEW YORK, Apr. 9, 1919

The metal markets of this week have been characterized by dullness in copper, which was not unnatural in view of the large business in several weeks previous. There was emphatic pressure to sell lead, which consequently declined, following which a drastic cut was made. Zinc showed a little strength, on the strength of the smelters' strike, but relapsed.

Advices from Europe respecting the metal situation over there are not encouraging. Great Britain has adopted the policy of liquidating its stocks at the market, and, consequently, will undersell the offerings of new products. The French at first had some different ideas, but according to latest reports the Ministry of Finance is advertising the sale of copper and zinc at prices based on the London market.

In view of the general industrial unrest throughout Europe and the almost complete cessation of business in some parts of it, the outlook for consumption is not rosy. However, the composition of labor troubles in Great Britain, although it practically amounts to an industrial revolution, may pave the way for getting to work in that country.

Copper—During the first three days of the week there was some substantial buying at 15½c., delivered, but there was no general participation in this business, some producers failing to get much inquiry. With the beginning of the calendar week, demand dwindled to small proportions, and there was some cutting of prices, which was not, however, much advertised.

An error was made in the computation of the March average price of electrolytic copper in New York. The erroneous report was 14.855c.; the corrected report is 14.856c.

Copper Sheets—The base price of copper sheets is 22½c. per lb. Copper wire is quoted at 17½c. per lb. f.o.b. mill, carload lots.

Tin—There is nothing new to report in this market. It is stated that the last of the tin purchased by the U. S. Steel Products Co. has now arrived in this country.

Lead—Right from the beginning of the week there was a distinct pressure to sell lead, and a considerable tonnage was placed at prices ranging downward from 5.20 to 5.15c. The prime cause for this was the discernment of a distinct threat to our market resulting from the situation in London. At 5.15c. sellers halted, or rather found their market taken away from them. About noon on Apr. 9 it became known that the American Smelting and Refining Co. had reduced its prices to 5c., New York, and 4¾c., St. Louis. In fact, the reduction was made on Apr. 8, but few persons in the trade became aware of it until the following day. Upon the news becoming public, other producers offered at 4.95c., New York.

Zinc—With the strike in progress at some Oklahoma works, and with a meeting in Washington to consider the liquidation of the Government stock, the market exhibited a shade more of strength, some sales for future delivery being made as high as 6.30c., while prompt was done for 5c. or less. However, there was no snap to the market, and since Monday it has eased off. No very large business was done during the week.

Belgium will soon be a producer of spelter to a considerable extent.

An interesting feature of our market during the last week or two has been business in high-grade zinc at 6¾c. With common zinc at 6¼c., the differential has thus contracted to ½c. per pound.

A committee of zinc producers, consisting of W. A. Ogg, president, American Zinc, Lead and Smelting Co.; Edgar Palmer, president, New Jersey Zinc Co.; C. M. Loeb, president, American Metal Co.; Edward Mosehauer, Anaconda Copper Mining Co.; and S. S. Tuthill, secretary, American Zinc Institute, met the Director of Sales in the War Department on Apr. 3 for consideration of the liquidation of the stocks of spelter held by the Government. Figures were presented showing that the stock is not so large as previously had been supposed. Nevertheless, it is large enough and is a serious matter. It is probable that some arrangement will be made for the liquidation of this stock similar to what was effected in the case of copper.

Zinc Sheets—The quoted price of zinc sheets is $11 per 100 pounds.

Other Metals

Aluminum—Prices quoted range from 29@31c. Unchanged.

Antimony—There was a little more business done, under the influence of which there was a slight firming of prices. At the close we quote spot at 6¾@7c., and futures at 6⅞@6¾c.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.20 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.40 per lb. in lots of 500 pounds.

Nickel—Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—This market was steady at $67@70. San Francisco telegraphs $70, with a firmer tone.

Silver and Platinum

Silver—As the fluctuations in London exchange have not been so erratic this week, the fixed price for silver in London has not changed much; opening Apr. 3 at 48⅞d. and closing at 48⅛d. Shipments the last week as reported were 300,000 oz. for France and 779,000 oz. for London.

Mexican dollars at New York: Apr. 3, 77⅛; Apr. 4, 77⅛; Apr. 5, 77⅛; Apr. 7, 77⅛; Apr. 8, 77⅛; Apr. 9, 77⅛.

Platinum—Unchanged at $99@100 for refined ingot.

Palladium—We quote $115@120. A round lot was sold at $117.

Zinc and Lead Ore Markets

Joplin, Mo., Apr. 5—Blende, per ton, high, $42.90; basis 60% zinc, premium grade, $40; Prime Western, $40@39; sludge, $37.50; flotation, $35; calamine, basis 40% zinc, $25@26. Average settling prices, blende, $39.82; calamine, $28; all zinc ores, $39.34.

Lead, high, $64.10; basis 80% lead, $62@60; average settling price, all grades of lead, $60.78 per ton.

Shipments the week: Blende, 11,512; calamine, 498; lead, 1542 tons. Value, all ores the week, $567,210.

A light tonnage of blende, assaying 50% to 54% zinc and carrying 6 to 8% iron, was sold on a basis of $42 for 60% zinc, but not carried as a price quotation, as the settling price will be about $30 per ton.

A marked appreciation in blende prices came this week, to the gratification of sellers, Prime Western and lower grades getting a raise of $1@2.50 per ton.

Platteville, Wis., Apr. 5—Blende, basis 60% zinc, $42.50 base for premium grade and $40 base for high-lead blende. Lead ore, basis 80% lead, $58 per ton. Shipments reported for the week are 2819 tons blende, 149 tons galena, and 374 tons sulphur ore. For the year to date the totals are 26,298 tons blende, 1182 tons lead, and 447 tons sulphur ore. During the week 2586 tons blende was shipped to separating plants.

Other Ores

Tungsten Ore—Charles Hardy reports as follows under date of Apr. 8: "The activity reported during the previous week in tungsten ore continued during the present week, and a fair tonnage has changed hands. While at one time Chinese ore could be had at almost any price, and business was done at very low prices, it has been exceedingly difficult during the last week to do business even at prices ranging around $6. At the time of writing there are more buyers than sellers at this figure. The prospects of the market, while not just now for much higher prices, are certainly for a firmer market, and a moderate advance should be looked forward to even in the near future. No new arrivals of ore have been reported. There are several inquiries for ferrotungsten for export in the market, and while the quantities are still small, the number of inquiries coming from many quarters show the prospects of business in that direction to be good."

Molybdenum Ore—No business reported. The nominal quotation is 80c. per lb. of molybdenum sulphide, but it is probable that ore can actually be bought for less.

Pyrites—Spanish pyrites is quoted at 17c. on the basis of 10s. ocean freight. Unchanged.

Iron Trade Review

PITTSBURGH—Apr. 8

An open market for pig iron is a probability for the near future, while an open market for steel products is a distinct possibility. The criticism of the Railroad Administration for refusing to buy steel products at the Redfield board prices comes chiefly from poorly informed quarters. Too many earnings reports of steel companies

for 1918 have been published to leave room for doubt that large reductions in prices could be made and still leave large profits, provided there is the necessary tonnage. For instance, the Steel Corporation's profits could be cut in half from 1918 to 1919 and still leave larger earnings applicable to bond interest and dividends, because of the large deductions that had to be made from 1918 profits and will have to be made from this year's profits. The corporation's total profits in 1918 were about $550,000,000, while if its profits in 1919 were $275,000,000 the Federal taxes would be only between $55,000,000 and $60,000,000, against $274,000,000 allowed by the corporation report for 1918. As to the small producers, for whose benefit it is said steel prices must be maintained, many are already closed for lack of orders and others are closing. The large mills are running chiefly on old orders. Rails, the largest bone of contention between the Industrial Board and the Railroad Administration, are not made by small concerns, only by the Steel Corporation, Midvale, Bethlehem, Lackawanna and Colorado.

Buying of steel products continues very restricted in character, showing that the general public agrees with the Railroad Administration in refusing to take hold. Large reductions in steel prices, alone, would hardly produce much construction activity, as other commodities must be liquidated also, as well as many items of labor. As to common labor, it is doubtful whether the rate will ever decline very much. Sellers of the other building materials are indisposed to reduce prices, taking their cue from the steel industry rather than from the copper industry. The well-meant plan of Secretary Redfield for stimulating industry has failed because stabilization by reducing prices to a fair and safe level was abandoned in favor of an attempt to stabilize by making slight reductions and then regarding them as guaranteed for the remainder of the year. Even such a period, three times that for which the War Industries Board used to set prices, would not induce the capitalist to invest his money this year instead of next year.

At this writing the Industrial Board is still endeavoring to induce the Railroad Administration to pay its suggested prices, and shows no inclination to approach the steel industry for further reductions. The chances are the whole effort will fade away and the steel market drift, with light demand and occasional recessions as one producer or another cuts prices.

Pig Iron—Sentiment among the merchant blast furnaces is very strong against the situation created by the Industrial Board. Demand for pig iron is not stimulated, and furnaces receive less for what little they do sell. Lower steel prices, the furnaces contend, would make more pig iron demand and eventually pig-iron prices and cost of production would establish themselves in proper relation with each other. The fixed price system is not working well, as for a proper distribution of business the pig iron districts need to compete with each other. There is no inquiry locally. Last week the Standard Sanitary Mfg. Co., Pittsburgh, bought 1750 tons of foundry iron for April delivery to its Louisville plant, paying the recognized price, f.o.b. the respective furnaces, this representing a concession on the part of those furnaces that had less freight than the Birmingham rate. We quote: Bessemer, $27.95; basic, $25.75; foundry, $26.75; malleable, $26.25; forge, $25.75, f.o.b. Valley furnaces, with $1.40 freight to Pittsburgh.

Steel—There is no new buying. Sheet mills are specifying from hand to mouth on sheet bar contracts, involving a fair tonnage. There is no demand for forging billets, as the forge shops have hardly any business. We quote: Billets, $38.50; sheet bars and 2-inch billets, $42; slabs, $41; rods, $52.

Ferromanganese—The market continues very quiet and in control of resale material, available at $130, delivered, for 80%. Any considerable demand would absorb the resale material and put the market in the hands of producers, who now ask $150, delivered, for 80%. Resale spiegeleisen remains at about $42, shipping point, for 18%, and there is practically no demand.

Coke

Coke—Settlements for April shipments of furnace coke on adjustment contracts have generally been made at $4.25, or about the same as for March. Consumption continues to decline, several furnaces that had been using Connellsville coke having blown out in the past week, while several more are on the verge of going out. Odd lots of spot coke are occasionally offered down to $3.75. Foundry coke can be had at $4.50, with good grades at $5.25, while a few operators are holding to $6. Production has been running lighter and lighter and in the Connellsville and Lower Connellsville region will probably be 175,000 to 180,000 tons this week.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1917	1918	1919	1917	1918	1919
Jan.	75.630	88.702	101.125	36.682	44.356	48.438
Feb.	77.585	85.716	101.125	37.742	42.792	48.027
Mar.	73.861	88.082	101.125	36.410	43.620	48.171
April	73.875	95.346	.....	36.963	47.215	.....
May	74.745	99.505	.....	37.940	48.980	.....
June	76.971	99.500	.....	39.065	48.875	.....
July	79.010	99.625	.....	40.110	48.813	.....
Aug.	85.407	100.292	.....	43.418	49.077	.....
Sept.	100.740	101.125	.....	50.920	49.500	.....
Oct.	87.332	101.125	.....	44.324	49.500	.....
Nov.	85.891	101.125	.....	43.584	48.969	.....
Dec.	85.960	101.125	.....	43.052	48.492	.....
Year	81.417	96.772	.....	40.851	47.516	.....

New York quotations cents per ounce troy, 999 fine; London, pence per ounce, sterling silver, 925 fine.

Copper	New York Electrolytic		London Standard		London Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	106.619
Feb.	23.500	16.763	110.000	78.700	125.000	95.700
Mar.	23.500	14.856	110.000	76.821	125.000	82.071
April	23.500	.....	110.000	.....	125.000	.....
May	23.500	.....	110.000	.....	125.000	.....
June	23.500	.....	110.000	.....	125.000	.....
July	25.904	.....	119.913	.....	134.913	.....
Aug.	26.000	.....	122.000	.....	137.000	.....
Sept.	26.000	.....	122.000	.....	137.000	.....
Oct.	26.000	.....	122.000	.....	137.000	.....
Nov.	26.000	.....	122.000	.....	137.000	.....
Dec.	(a)	.....	118.447	.....	133.167	.....
Year	24.628	.....	115.530	.....	130.507	.....

(a) No Market.

Tin	New York		London	
	1918	1919	1918	1919
January	85.500	67.702	293.227	248.557
February	92.000	66.801	311.525	223.963
March	(a)	67.934	318.875	236.843
April	(a)	.....	329.905	.....
May	(a)	.....	364.217	.....
June	(a)	.....	331.925	.....
July	(a)	.....	360.347	.....
August	(a)	.....	380.900	.....
September	(a)	.....	343.905	.....
October	(a)	.....	335.543	.....
November	(a)	.....	323.550	.....
December	(a)	.....	267.736	.....
Av. year	(a)	.....	330.138	.....

(a) No average computed.

Lead	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.00	37.227
February	6.973	5.057	6.899	4.784	29.00	28.675
March	7.201	5.226	7.091	4.992	29.00	27.952
April	6.772	.....	6.701	.....	29.00	.....
May	6.818	.....	6.704	.....	29.00	.....
June	7.611	.....	7.511	.....	29.00	.....
July	8.033	.....	7.750	.....	29.00	.....
August	8.050	.....	7.750	.....	29.00	.....
September	8.050	.....	7.750	.....	29.00	.....
October	8.050	.....	7.750	.....	29.00	.....
November	8.050	.....	7.750	.....	31.20	.....
December	6.564	.....	6.324	.....	40.00	.....
Year	7.413	.....	7.222	.....	30.10	.....

Spelter	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	7.836	7.272	7.661	6.922	54.000	56.045
February	7.814	6.623	7.639	6.273	54.000	46.150
March	7.461	6.500	7.286	6.150	54.000	38.500
April	6.890	.....	6.715	.....	54.000	.....
May	7.314	.....	7.114	.....	54.000	.....
June	8.021	.....	7.791	.....	54.000	.....
July	8.688	.....	8.338	.....	54.000	.....
August	8.985	.....	8.635	.....	54.000	.....
September	9.442	.....	9.092	.....	54.000	.....
October	8.801	.....	8.451	.....	54.000	.....
November	8.491	.....	8.141	.....	54.100	.....
December	8.163	.....	7.813	.....	56.050	.....
Year	8.159	.....	7.890	.....	54.180	.....

New York and St. Louis quotations, cents per pound London, pounds sterling per long ton.

Pig Iron Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1918	1919	1918	1919	1918	1919
January	$37.25	$33.60	$33.95	$31.40	$33.95	$32.40
February	37.25	33.60	33.95	31.40	33.95	32.40
March	37.25	32.54	33.95	31.40	33.95	29.12
April	36.15	.....	32.95	.....	33.95	.....
May	36.20	.....	33.00	.....	34.00	.....
June	36.36	.....	33.16	.....	34.16	.....
July	36.60	.....	33.40	.....	34.40	.....
August	36.60	.....	33.40	.....	34.40	.....
September	36.60	.....	33.40	.....	34.40	.....
October	36.60	.....	34.40	.....	35.40	.....
November	36.60	.....	34.40	.....	35.40	.....
December	36.60	.....	34.40	.....	35.40	.....
Year	$36.67	.....	$33.70	.....	$34.45	.....

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.† Apr. 8	
Alaska Gold M.	3
Alaska Juneau	2
Am.Sm.&Ref.,com.	71
Am.Sm. & Ref., pf.	105
Am.Sm.Sec., pf., A	91
Am. Zinc	13
Am. Zinc, pf.	44
Anaconda	62
Batopilas Min.	1
Bethlehem Steel	72
Butte & Superior	21
Butte Cop. & Zinc	7
Cerro de Pasco	39
Chile Cop.	23
Chino	37
Colo. Fuel & Iron	44
Crucible Steel	67
Crucible Steel, pf.	94
Dome Mines	12
Federal M. & S.	9
Federal M. & S., pf.	35
Great Nor., ore ctf.	42
Greene Cananea	43
Gulf States Steel	55
Homestake	98
Inspiration Con.	51
International Nickel	27
Kennecott	32
Lackawanna Steel	71
Mexican Petrol.	184
Miami Copper	23
Nat'l Lead, com.	68
National Lead, pf.	108
Nev. Consol.	16
Ontario Min.	6
Ray Con	21
Republic I.&S., com.	83
Republic I.&S., pf.	102
Sloss-Sheffield	54
Tennessee C. & C.	14
U. S. Steel, com.	98
U. S. Steel, pf.	116
Utah Copper	76
Va. Iron C. & C.	56
Worthington Pump	65

BOSTON CURB* Apr. 8	
Alaska Mines Corp.	‡.12
Boston Ely	1
Boston & Mont.	.62
Butte & Lon'n Dev.	.11
Calaveras	1
Chief Con.	3
Contact	.05
Corbin	‡.25
Cortez	.12
Crown Reserve	.37
Crystal Cop.	.27
Eagle & Blue Bell	2
First Nat. Cop.	1
Houghton Copper	.20
Intermountain	‡.05
Iron Blossom	.35
Iron Cap.	11
Majestic	.09
Mexican Metals	.23
Mines of America	‡.05
Mojave Tungsten	.05
Nat. Zinc & Lead	.08
Nevada-Douglas	.13
New Baltic	1
Oneco	.20
Pacific Mines	‡.25
Rex Cons.	.05
Yukon Gold	.70

SAN FRAN.* Apr. 8	
Alta	.01
Andes	.07
Best & Belcher	.04
Caledonia	.10
Challenge Con.	‡.03
Confidence	‡.03
Con. Virginia	.54
Gould & Curry	.03
Hale & Norcross	.12
Jacket-Cr. Pt.	.05
Mexican	‡.17
Occidental	.40
Ophir	.47
Overman	.02
Savage	.05
Sierra Nevada	.15
Union Con.	.13
Utah Con.	‡.02
Belmont	3.00
Jim Butler	.38
MacNamara	.76
Midway	.44
Mont.-Tonopah	.20
North Star	.08
Rescue Eula	.08
West End Con.	1.82
Atlanta	.05
Booth	.25
Comb. Frac.	‡.03
Florence	.40
Jumbo Extension	.13
Kewanas	.04
Nevada Hills	.03
Nevada Packard	.25
Round Mountain	.38
Silver Pick	.08
White Caps	.13

COLO. SPRINGS* Apr. 8	
Cresson Con.	5.00
Doctor Jack Pot	.06
Elkton Con.	.04
El Paso	.15
Gold Sovereign	‡.02
Golden Cycle	1.89
Granite	.15
Isabella	.05
Mary McKinney	.06
Portland	.95
United Gold M.	.18
Vindicator	.40

BOSTON EXCH.† Apr. 8	
Adventure	175
Ahmeek	73
Algomah	.30
Alloues	39
Ariz. Com.	12
Arnold	‡.20
Bingham Mines	38
Bonanza	‡.10
Butte-Balaklava	.30
Calumet & Ariz.	61
Calumet & Hecla	415
Centennial	‡12
Copper Range	44
Daly West	2
Davis-Daly	5
East Butte	8
Franklin	3
Granby	‡70
Hancock	‡5
Hedley	‡12
Helvetia	‡.25
Indiana	‡.50
Isle Royale	26
Keweenaw	1
Lake	4
La Salle	‡2
Mason Valley	‡2
Mass	4
Mayflower	3
Michigan	3
Mohawk	58
New Arcadian	11
New Cornelia	17
New Idria	‡19
North Butte	11
North Lake	‡.50
Ojibway	‡1
Old Dominion	35
Osceola	51
Quincy	58
St. Mary's M. L.	‡40
Santa Fe	‡.25
Seneca	14
Shannon	2
Shattuck-Ariz.	‡14
So. Lake	.99
So. Utah	‡.12
Superior	5
Superior & Bost.	2
Trinity	2
Tuolumne	‡.75
U. S. Smelting	50
U. S. Smelting, pf.	47
Utah Apex	2
Utah Con.	8
Utah Metal	2
Victoria	2
Winona	.80
Wolverine	16

N. Y. CURB† Apr. 8	
Big Ledge	.75
Butte & N. Y.	
Butte Detroit	.05
Caledonia	.39
Calumet & Jerome	1
Can. Cop. Corpn.	1
Carlisle	‡12
Cashboy	‡.13
Con. Ariz. Sm.	1
Con. Coppermines	‡5
Goldfield Con.	.19
Goldfield Merger	.07
Greenmonster	‡
Hecla Min.	5
Howe Sound	‡3
Jerome Verde	‡
Louisiana	
Magma	31
Marsh	.07
McKinley-Dar-Sa.	.50
Milford	‡.75
Mother Lode	.38
Nixon Nevada	.30
Ohio Cop.	
Rawley	‡2
Ray Hercules	2
Richmond	‡.56
Rochester Mines	.21
St. Joseph Lead	‡12
Standard S. L.	
Stewart	.16
Success	.04
Tonopah	‡3
Tonopah Ex.	2
Tribullion	.25
Troy Arizona	‡.10
United Eastern	5
United Verde Ext.	‡32
United Zinc	‡
Utica Mines	‡.08

TORONTO* Apr. 8	
Adanac	.17
Bailey	.04
Beaver Con.	.43
Chambers Ferland	‡.10
Coniagas	2.00
Hargraves	.02
Kerr Lake	5.00
La Rose	.25
Lake Shore	.93
Min. Corp. of Can.	2.00
Nipissing	‡8.75
Peterson Lake	.07
Temiskaming	.32
Wettlaufer-Lor.	.04
Davidson	.68
Dome Exten.	.25
Dome Lake	.24
Mollinger	6.12
McIntyre	1.62
Newray	.12
Pocu. Crown	.26
Teck-Hughes	.26
Vipond	.20
West Dome	.13

* Bid prices. † Closing prices. ‡ Last quotations.

Current Prices—Materials and Supplies

IRON AND STEEL

SHEETS—Quotations are in cents per pound in various cities from warehouse, also the base quotations from mill:

Blue Annealed	Large Mill Lots Pittsburgh	St. Louis	Chicago	San Francisco	New York Current	New York One Yr. Ago
No. 10	3.55	4.29	4.57	5.80	4.57	5.45
No. 12	3.60	4.34	4.62	5.85	4.62	5.50
No. 14	3.65	4.39	4.67	5.90	4.67	5.55
Black						
Nos. 18 and 20	4.15	5.04	5.17	6.75	5.42	6.25
Nos. 22 and 24	4.20	5.14	5.22	6.80	5.47	6.30
No. 26	4.25	5.19	5.27	6.95	5.52	6.40
No. 28	4.35	5.29	5.37	7.05	5.62	6.45
Galvanized:						
No. 10	4.70	5.64	5.72	....	5.97	6.70
No. 12	4.80	5.64	5.82	7.30	6.02	6.80
No. 14	4.80	5.64	5.82	7.30	6.02	6.80
Nos. 18 and 20	5.10	5.84	6.12	7.60	6.37	7.10
Nos. 22 and 24	5.25	5.99	6.25	7.75	6.52	7.25
No. 26	5.40	5.69	6.42	7.90	6.67	7.40
No. 28	5.70	6.44	6.72	8.20	6.97	7.70

STEEL RAILS—The following quotations are per gross ton f.o.b. Pittsburgh and Chicago for carload or larger lots. For less than carload lots 5c. per 100 lb. is charged extra:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago Current	Chicago One Year Ago
Standard bessemer rails	$45.00	$55.00	$45.00	$65.00
Standard openhearth rails	47.00	57.00	47.00	67.00
Light rails, 8 to 10 lb	2.58½*	3.13½*	2.83½*	3.13½*
Light rails, 12 to 14 lb	2.44*	3.09*	2.79*	3.09*
Light rails, 25 to 45 lb	2.45*	3.00*	2.70*	3.00*

* Per 100 lb.

TRACK SUPPLIES—The following prices are base per 100 lb. f. o. b. Pittsburgh for carload lots, together with the warehouse prices at the places named:

	Pittsburgh Current	Pittsburgh One Year Ago	Chicago	St. Louis	San Francisco
Standard railroad spikes, ⅝-in. and larger	$3.25	$3.90	$4.27	$5.04	$6.15
Track bolts	4.90	4.90	5.17	Premium	7.20
Standard section angle bars	3.00	3.25	4.22	Premium	4.95

STRUCTURAL MATERIAL—The following are the base prices f. o. b. mill, Pittsburgh, together with the quotations per 100 lb. from warehouses at the places named:

	Mill Pittsburgh	New York Current	New York 1 Yr. Ago	St. Louis	Chicago
Beams, 3 to 15 in	$2.45	$3.47	$4.19½	$3.39	$3.47
Channels, 3 to 15 in	2.45	3.47	4.19½	3.39	3.47
Angles, 3 to 6 in. ¼ in. thick	2.45	3.47	4.19½	3.39	3.47
Tees, 3 in. and larger	2.45	3.52	4.19½	3.39	3.47
Plates	2.66	3.67	4.44½	3.39	3.67

STEEL SHEET PILING—The following price is base per 100 lb. f. o. b. Pittsburgh, with a comparison of a month and a year ago:

Current	One Month Ago	One Year Ago
$2.55	$3.50	$4–5

RIVETS—The following quotations are per 100 lb.:

STRUCTURAL

	Mill Pittsburgh	New York Current	New York One Year Ago	Warehouse Chicago	Warehouse St. Louis	Warehouse San Francisco	Dallas
½-in. and larger	$4.20	$5.05	$6.095	$4.87	$4.94	$6.70	$6.75
CONE HEAD BOILER							
½ in. and larger	4.30	5.15	6.195	4.97	5.04	6.80	6.75
⅝ and ¾	4.45	5.30	6.345	5.12	5.19	6.95	6.90
⅞ and 1	4.70	5.55	6.695	6.47	5.44	7.30	7.15

Lengths shorter than 1 in. take an extra of 50c. Lengths between 1 in. and 2 in. take an extra of 25c.

WIRE ROPE—Discounts from list price on regular grades of bright and galvanized are as follows:

	New York and St. Louis
Galvanized iron rigging	+12½%
Galvanized cast steel rigging	7½%
Bright plow steel	35%
Bright cast steel	22½%
Bright iron and iron tiller	5%

HORSE AND MULE SHOES—Warehouse prices per 100 lb. in cities named:

	Mill Pittsburgh	Cincinnati	Chicago	St. Louis	Denver	Birmingham
Straight	$5.75	$7.50	$6.50	$6.25	$8.50	$7.35
Assorted	....	7.50	6.50	6.40	8.75	7.60

BAR IRON AND STEEL—Per pound to large buyers at mill, Pittsburgh:

Iron bars..... 2.75c. Steel bars..... 2.35c.

COAL BIT STEEL—Warehouse price per pound is as follows:

New York	Cincinnati	Birmingham	St. Louis	Denver	Chicago
$0.12	$0.16½	$0.18	$0.19	$0.18½	$0.16½

DRILL STEEL—Warehouse price per pound:

	New York	St. Louis	Birmingham	Denver
Solid	14c.	14c.	15c.	16c.
Hollow	21c.	25c.	...	28c.

STEEL AND IRON PIPE—The following discounts are for carload lots f. o. b. Pittsburgh, basing card of Jan. 1 for steel pipe and iron pipe:

BUTT WELD

Inches	Steel Black Per Cent.	Steel Galvanized Per Cent.	Inches	Iron Black Per Cent.	Iron Galvanized Per Cent.
¼ to 3	57½	44	⅛ to 1¼	39	23½
LAP WELD					
2	50½	38	1¼	24½	9½
2½ to 6	53½	41	1½	31½	17½
7 to 12	50½	37	2	32½	18½
13 and 14	41	..	2½ to 6	34½	21½
15	38½	..	7 to 12	31½	18½
BUTT WELD, EXTRA STRONG PLAIN ENDS					
⅛, ¼ and ⅜	46½	29	⅛, ¼ and ⅜	28½	11½
½	51½	39	½	33½	20½
¾ to 1¼	55½	43	¾ to 1½	39½	24½
2 to 3	56½	44			
LAP WELD, EXTRA STRONG PLAIN ENDS					
2	48½	37	1½	25½	10½
2½ to 4	51½	40	1½	31½	17½
4½ to 6	50½	39	2	33½	20½
7 to 8	46½	33	2½ to 4	35½	23½
9 to 12	41½	28	4½ to 6	34½	22½
			7 to 8	26½	14½
			9 to 12	21½	9½

From warehouses at the places named the following discounts hold for steel pipe:

	Black New York	Black Cleveland	Black Chicago
¼ to 3 in. butt welded	47%	46½%	51½%
3½ to 6 in. lap welded	42%	42½%	53½%
	Galvanized New York	**Galvanized Cleveland**	**Galvanized Chicago**
¼ to 3 in. butt welded	31%	31%	44%
3½ to 6 in. lap welded	27%	37½%	41%

Malleable fittings, Class B and C, from New York stock sell at list plus 15%. Cast iron, standard sizes, 5%.

NUTS—From warehouse at the places named, on fair-sized orders, the following amount is deducted from list:

	New York Current	New York One Year Ago	Cleveland Current	Cleveland One Year Ago	Chicago Current	Chicago One Year Ago
Hot pressed square	$0.25	$1.00	$1.90	$1.40	$1.28	$1.05
Hot pressed hexagon	.25	1.00	1.90	1.20	1.08	.85
Cold punched square	2.25	1.00	1.90	.75	1.30	1.50
Cold punched hexagon	2.25	1.00	1.90	.75	1.30	1.50

Semifinished nuts sell at the following discounts from list price:

	Current	One Year Ago
New York	50–10%	40%
Chicago	50%	50%
Cleveland	50–30%	60%

MACHINE BOLTS—Warehouse discounts in the following cities:

	New York	Cleveland	Chicago
½ by 4 in. and smaller	40%	50%	45–5%
Larger and longer up to 1 in. by 30 in.	50%	40%	40%

WASHERS—From warehouses at the places named the following amount is deducted from list price:

For wrought-iron washers:
New York.....$2.00 Cleveland.....$2.00 Chicago.....$2.25
For cast-iron washers the base price per 100 lb. is as follows:
New York.....$5.00 Cleveland.....$4.00 Chicago.....$4.00

CONSTRUCTION MATERIALS

ROOFING MATERIALS—Prices per ton f. o. b. New York and Chicago:

	Carload Lots N. Y.	Carload Lots Chicago	Less Than Carload Lots N. Y.	Less Than Carload Lots Chicago
Tar felt (14 lb. per square of 100 sq.ft.)	$52.00	$52.50	$53.00	$53.50
Tar pitch (in 400-lb. bbl.)	19.00	16.00	20.00	17.00
Asphalt pitch (in barrels)	36.00	36.00	41.50	41.50
Asphalt felt	67.50	67.50	72.00	72.00

PREPARED ROOFINGS—Standard grade rubbered surface, complete with nails and cement, costs per square as follows in New York, St. Louis, Chicago and San Francisco:

	1-Ply c.l.	1-Ply l.cl.	2-Ply c.l.	2-Ply l.cl.	3-Ply c.l.	3-Ply l.cl.
No. 1 grade	$1.35	$1.60	$1.70	$1.95	$2.05	$2.30
No. 2 grade	1.20	1.45	1.50	1.75	1.80	2.05

Asbestos asphalt-saturated felt (14 lb. per square) costs $5.00 per 100 lb.

Slate-surfaced roofing (red and green) in rolls of 108 sq.ft. costs $2.10 per roll in carload lots and $2.35 for smaller quantities.

Shingles, red and green slate finish, cost $5.50 per square in carloads, $5.75 in smaller quantities, in Philadelphia.

HOLLOW TILE—

	4 x 12 x 12	8 x 12 x 12	12 x 12 x 12
St. Paul	$0.056	$0.11	$0.162
Seattle	.09	.175	.30
Los Angeles*	.082	.154	.23
New Orleans	.17	.23	.34

* F.o.b. factory, 4, 8 and 10 inch.

LUMBER—Price per M in carload lots:

	8 x 8-In. x 20 Ft. and Under				12 x 12-In. 20 Ft. and Under	
	P.	Fir	Hemlock	Spruce	P.	Fir
Boston	$46.50	$45.00	$45.00	$46.00	$52.00	$46.00
Cincinnati	37.00	.....	36.00	.....	41.00	.....
Kansas City	40.50	41.50	41.50	$39.50	45.50	43.50
Seattle	17.50	17.50	17.50	17.50	17.50	17.50
New Orleans	31.50	.....	.....	.....	36.50	.....
St. Paul	46.00	50.00	46.00	46.00	.....	53.00
Denver	44.00	34.50	34.50	.....	49.00	39.00
Atlanta	35.50	.....	.....	.....	48.00	.....

	1-In. Rough, 10 In. x 16 Ft. and Under			2-In. T. and Gr. 10 In. x 16 Ft.	
	P.	Fir	Hemlock	Y.P.	Fir
Boston	$50.00	$45.00	$40.00	$45.00	$48.50
St. Paul	50.50	40.00	40.00	48.50	44.50
Kansas City	50.00	55.75	55.75	53.50	61.00
Seattle	17.50	17.50	17.50	17.50	17.50
New Orleans	34.00	.....	.....	31.50	.....
Cincinnati	43.00	39.00	39.00	42.00	38.00
Denver	45.00	33.50	33.50	38.00	30.00
Atlanta	32.50	.....	.....	32.50	.....
Los Angeles	.....	29.00	28.00	.....	.....

* Los Angeles: Base price of fir is $32; of hemlock, $34; redwood, $35.

NAILS—The following quotations are per keg from warehouse:

	Mill Pittsburgh	St. Louis	Dallas	Chicago	San Francisco
Wire	$3.25	$4.00	$4.37	$5.00	$4.75
Cut	3.45	6.50	6.50	5.75	.....

PORTLAND CEMENT—These prices are for barrels in carload lots, without bags.

	Current	One Month Ago	One Year Ago with Bags
New York	$2.90	$2.45	$2.50
Jersey City	2.77	2.62	2.50
Boston	2.52	2.52	2.87
Chicago	2.00	2.05	2.36
Pittsburgh	2.10	2.15	2.71
Cleveland	2.27	2.32	2.84
Denver	2.62	2.67	3.20

Note—Bag charge is generally 15c. each.

LIME—Warehouse prices:

	Hydrated per Ton		Lump per 300-Lb. Barrel	
	Finished	Common	Finished	Common
New York	$17.50	$14.50	$2.90	$2.65
Kansas City	22.80	.....	2.35*	2.20*
Chicago	18.00	17.50	1.80*	1.10*
St. Louis	22.00	18.00	.....	1.75*
Boston	22.50	18.25	3.65	3.30
Dallas	2.25*	1.25*	.....	.....
San Francisco	19.00	.....	.....	2.00†
St. Paul	25.00	19.50	1.97‡	1.93†
New Orleans	.....	1.90	.....	.....
Atlanta	.....	.....	19.00‡	2.50*
Denver	.....	.....	26.25‡	2.50*
Los Angeles	.....	3.05†	.....	2.80†

* 200-lb. barrels. † Per 180-lb. bbl. ‡ Per ton.

Note—Refund of 10c. per barrel.

LINSEED OIL—These prices are per gallon:

	New York		Cleveland		Chicago	
	Current	One Year Ago	Current	One Year Ago	Current	One Year Ago
Raw per barrel	$1.55	$1.55	$1.68	$1.65	$1.66	$1.65
5-gal. cans	1.70	1.65	1.85	1.80	1.86	1.75

WHITE AND RED LEADS in 500-lb. lots sell as follows in cents per pound

	Red				White	
	Current		1 Year Ago		Current	1 Yr. Ago
	Dry	In Oil	Dry	In Oil	Dry and In Oil	Dry and In Oil
100-lb. keg	13.00	14.50	11.25	11.50	13.00	12.50
25- and 50-lb. kegs	13.25	14.75	11.50	11.75	13.25	12.75
12½-lb. keg	13.50	15.00	11.75	12.00	13.50	13.00
5-lb. cans	15.00	16.50	13.25	13.00	15.00	14.50
1-lb. cans	16.00	17.50	13.25	13.50	16.00	14.50

MINING AND MILLING SUPPLIES

HOSE—

	Fire	50-Ft. Lengths
Underwriters' 2½-in.		75c. per ft.
Common, 2½-in.		30%

	Air		
	First Grade	Second Grade	Third Grade
¾-in. per ft.	$0.55	$0.40	$0.30

Steam—Discounts from List

First grade..... 25% Second grade..... 35% Third grade..... 40%

LEATHER BELTING—Present discounts from list in the following cities are as follows:

	Medium Grade	Heavy Grade
New York	40–5%	35%
St. Louis	45%	50%
Chicago	45%	40+5%
Birmingham	30%	35%
Denver	35–5%	30%
Cincinnati	40—10%	40%

RAWHIDE LACING—50c. for cut; 45c. per sq.ft. for ordinary.

MANILA ROPE—For rope smaller than ¾-in. the price is ½ to 2c. extra; while for quantities amounting to less than 600 ft. there is an extra charge of 1c. The number of feet per pound for the various sizes is as follows: ¼-in., 8 ft., ⅜-in., 6; ½-in., 4½; ⅝-in., 3½; ¾-in., 2 ft. 10 in.; 1-in., 2 ft. 4 in. Following is price per pound for ¾-in. and larger, in 1200-ft. coils:

Boston	$0.26	Denver	$0.32
New York	.29	Kansas City	.29
Cincinnati	.29	New Orleans	.28½
Chicago	.26½	Seattle	.27½
St. Paul	.30	St. Louis	.27
San Francisco	.26	Atlanta	.34

PACKING—Prices per pound:

Rubber and duck for low-pressure steam	$0.95
Asbestos for high-pressure steam	1.60
Duck and rubber for piston packing	1.00
Flax, regular	1.20
Flax, waterproofed	1.60
Compressed asbestos sheet	1.00
Wire insertion asbestos sheet	1.20
Rubber sheet	.60
Rubber sheet, wire insertion	.80
Rubber sheet, duck insertion	.50
Rubber sheet, cloth insertion	.30
Asbestos packing, twisted or braided and graphited, for valve stems and stuffing boxes	1.20
Asbestos wick, ½- and 1-lb. balls	.85

REFRACTORIES—Following prices are f. o. b. works, Pittsburgh:

Chrome brick	net ton	$120.00 at Chester, Penn.
Chrome cement	net ton	65.00 at Chester, Penn.
Clay brick, 1st quality fireclay	net ton	40–30 at Clearfield, Penn.
Clay brick, 2nd quality	net ton	38–48 at Clearfield, Penn.
Magnesite, dead burned	net ton	37.50 at Chewalah, Penn
Magnesite brick, 9 x 4½ x 2½ in.	net ton	90.00 at Chester, Penn.
Silica brick	net ton	45–55 at Mt. Union, Penn.

Standard size fire brick, 9 x 4½ x 2½ in. The second quality is $4 to $5 cheaper per 1000.

St. Louis—Fire Clay, $35 to $50.

Birmingham—Fire clay, $40–$45; silica, $40–$50; magnesite, $90; chrome, $120

Chicago—Second quality, $25 per ton.

RAILWAY TIES—For fair size orders, the following prices per tie hold:

	Material	7 In. x 9 In. by 8 Ft. 6 In.	6 In. x 8 In. by 8 Ft.
Chicago	Plain	1.48	1.33
San Francisco	Douglas Fir—Green	1.35	.96
San Francisco	Douglas Fir—Creosoted	2.70	1.92

Prices per tie at Missouri mills; St. Louis prices about 25c. higher:

Untreated A Grade White Oak 6x8x8		Untreated A Grade Red Oak 6x8x8	
No. 1	$0.70	No. 1	$0.55
No. 2	.80	No. 2	.65
No. 3	.90	No. 3	.75
No. 4	.98		
7x9x8 white oak	.....		1.05
7x9x8 red oak, No. 4	.80	No. 5	.87

FLOTATION OILS—Prices of oils for flotation, in cents per gallon, in barrels

	New York	Chicago In Bbl.	Chicago Carloads	Denver In Bbl Lots.
Pure steam-distilled pine oil, sp. gr. 0.925-0.94	$0.58	$0.71	$0.69	$ 0.81
Pure destructively distilled pine oil	.58	.68†	.66†	.55–.65
Pine tar oil, sp.gr. 1.02=1.035	.35	.36	.34	.60
Crude turpentine	.45	.68	.66	.60–.65
*Hardwood creosote, sp.gr. 0.96–0.99	.23	.....	.....	.42–.45

* F.o.b. Cadillac, Mich. † Very scarce.

COTTON WASTE—The following prices are in cents per pound:

	New York			
	Current	One Year Ago	Cleveland	Chicago
White	11.00 to 13.00	13.00	16.50	12.00 to 16.50
Colored mixed	8.50 to 12.00	10.00	13.00	11.50 to 14.00

WIPING CLOTHS—Jobbers' price per 1000 is as follows:

	13½ x 13½	13½ x 20½
Cleveland	$52.00	$58.00
Chicago	48.00	50.00

EXPLOSIVES—Price per pound of dynamite in small lots and price per 25 lb. keg for black powder:

	Low Freezing 20%	Gelatin 40%	Gelatin 60%	Gelatin 80%	Black Powder
New York	.....	$0.27½	$0.30	.....	$2.40
Boston	$0.27½	.24½	.26½	$0.31	2.40
Cincinnati	.19½	.21½	.23½	.....	2.35
Kansas City	.20½	.25½	.30½	.38½	2.45
New Orleans	.....	.24½	.28½	.....	.....
Seattle	.....	.18½	.21	.....	.....
Chicago	.18½	.21½	.25½	.29½	2.35
St. Paul	.19	.25½	.30½	.....	2.45
St. Louis	.19	.23½	.25½	.30	2.35
Denver	.17½	.24	.29	.35	2.60
Dallas	.21	.27½	.32	.38	.....
Los Angeles	.23	.30	.37	.....	2.95

CHEMICALS

SODIUM CYANIDE—New York price is 30c. per lb.; Denver, 42c.; Chicago, 31½c.; St. Louis, 31c.

SODIUM SULPHIDE—In New York the price per pound is 4½c. for concentrated, 2c. for crystals. The St. Louis price is 6c. for concentrated, 5½c. for fused; 3½c. for crystals. The Chicago price is 6c. for concentrated, 3½c. for crystals. Concentrated comes in 500-lb. drums, the crystals in 440-lb. bbl.

ZINC DUST—For 350 mesh the New York price is 12c. per lb.; Chicago, 13c.; Denver, 13½c. f. o. b. Pueblo; St. Louis, 12½c., less than car lots 13c.

ALUMINUM DUST—Chicago price is 1.30 per lb.

MINERS' LAMP CARBIDE—Prices net f.o.b. cars at warehouse points.

	Union 100-Lb. Drums Per Ton	Cameo 100-Lb. Drums Per Ton	Union 25-Lb. Drum Per Drum
East of the Mississippi, North of Chattanooga	$106.00	$101.00	$1.52
Southeastern portion U. S. A.	115.50	110.50	1.63
Texas (except El Paso)	124.00	119.00	1.74
El Paso, Texas	126.00	121.00	1.77
Denver, Colo.	124.00	119.00	1.74
West Coast	129.00	124.00	1.81